

Constraining the shape of the Universe using Circle Searches

Standard Cosmology at the
Threshold of Change
Aristotle University of Thessaloniki
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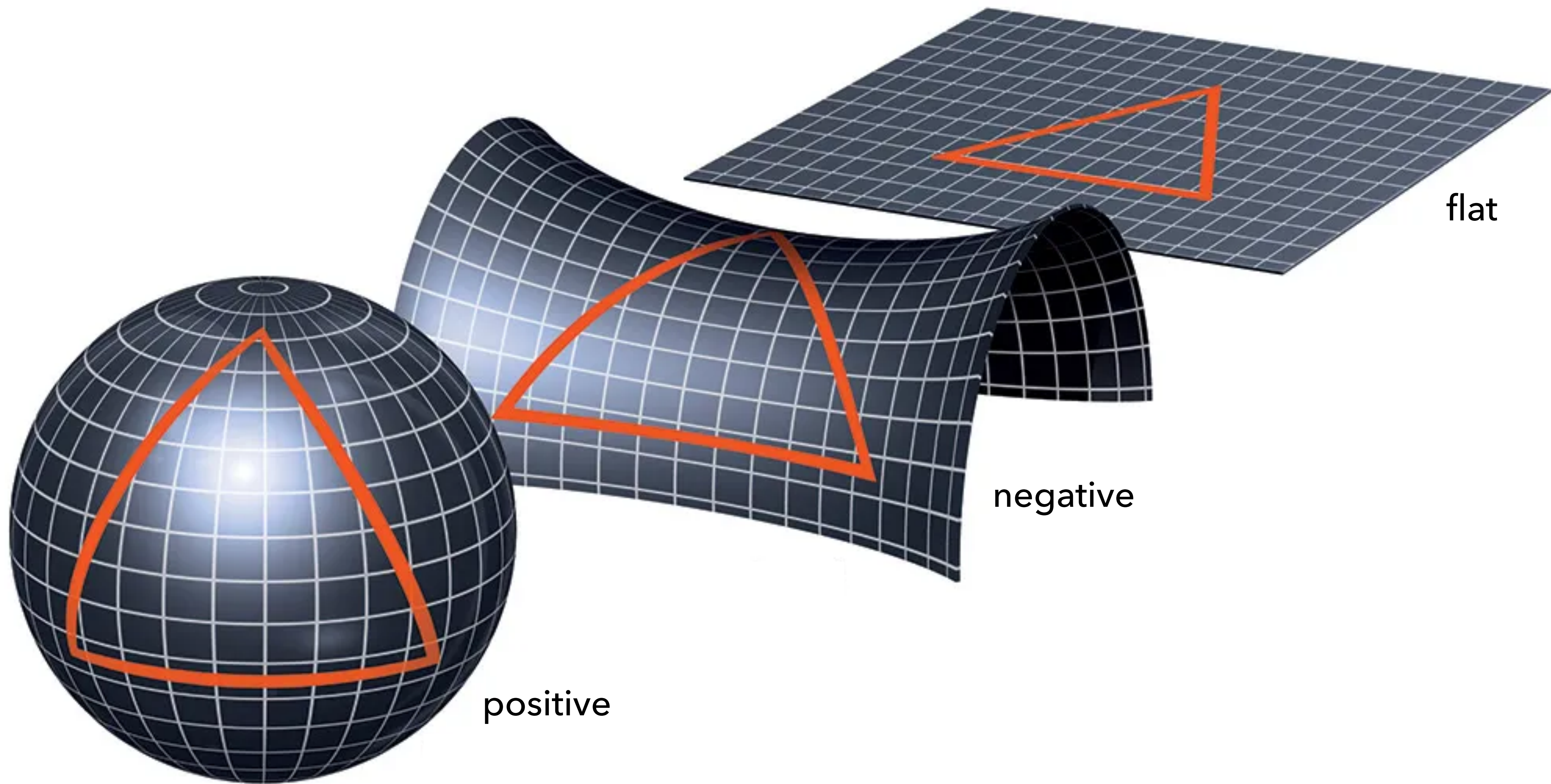
Thiago PEREIRA



**What is cosmic topology
and why study it?**



Wait, topology?!

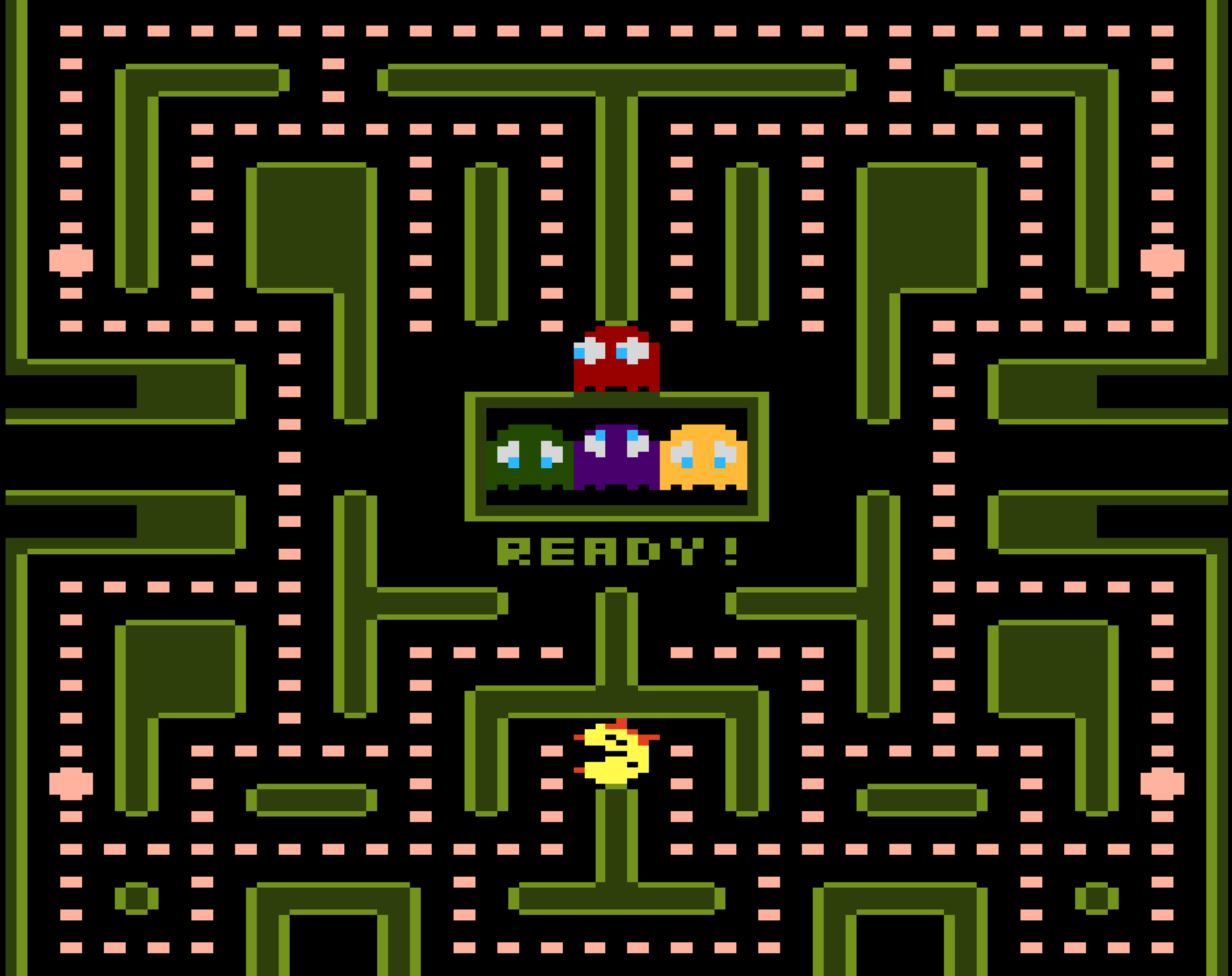


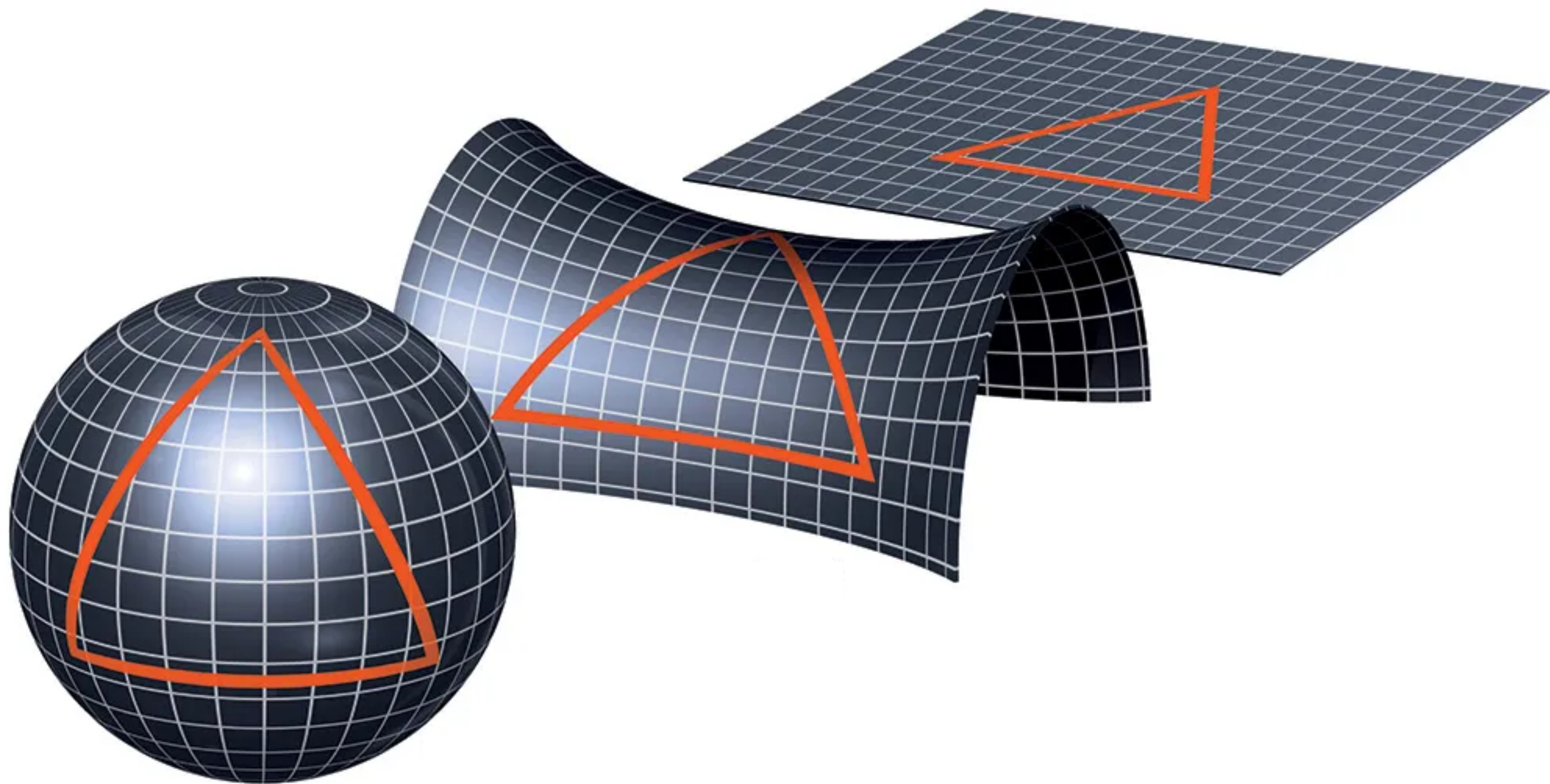
positive

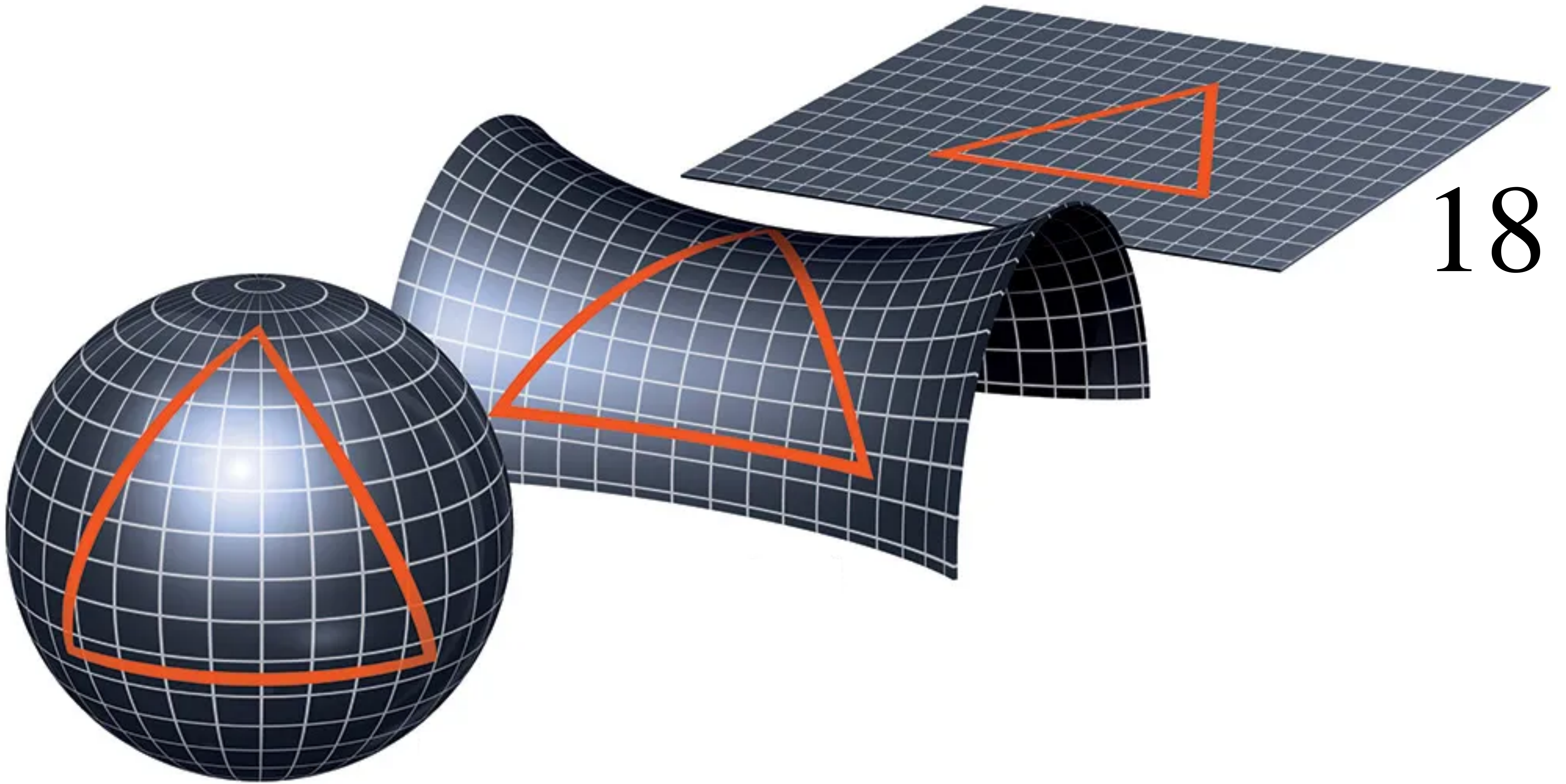
negative

flat

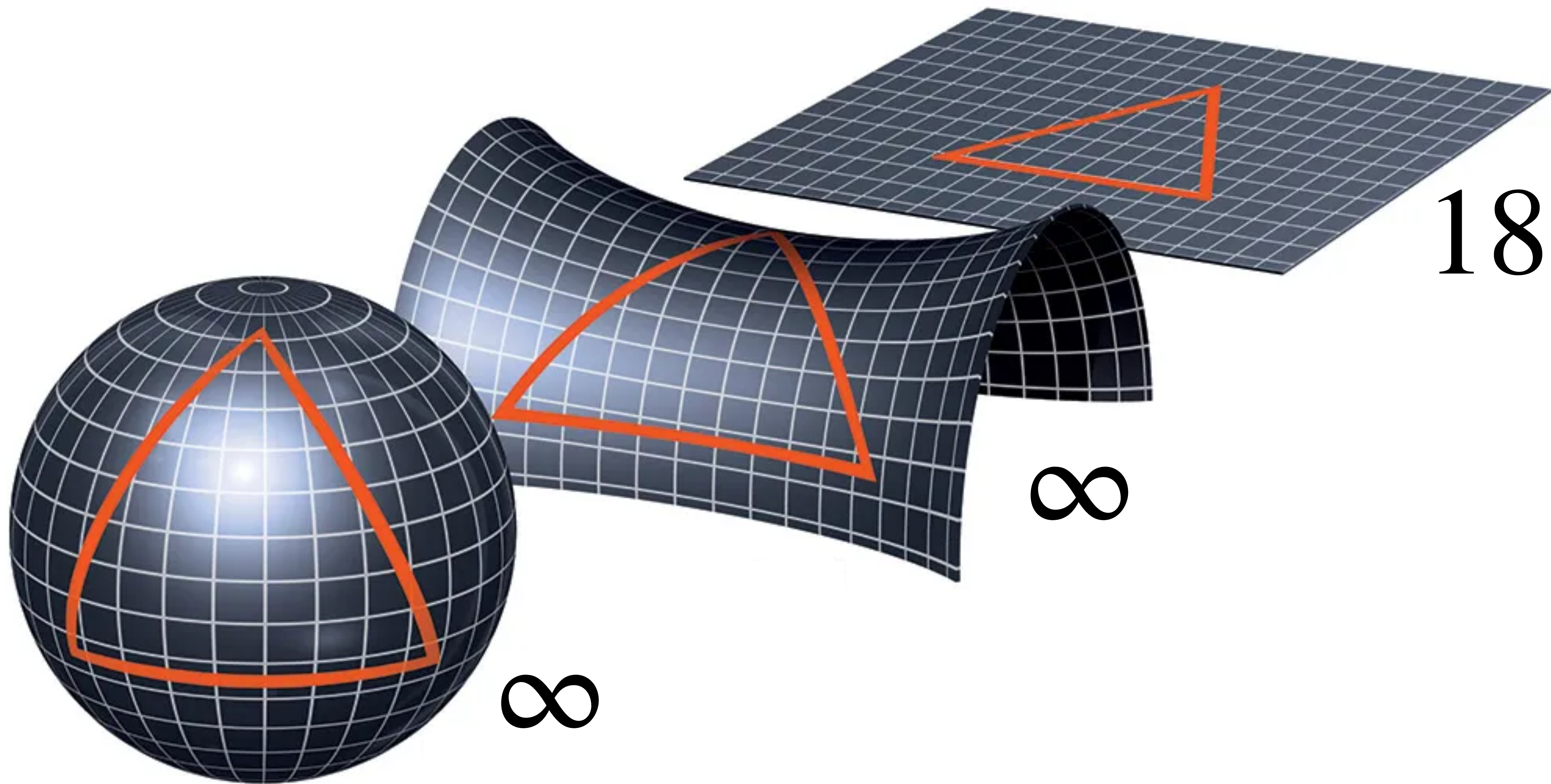


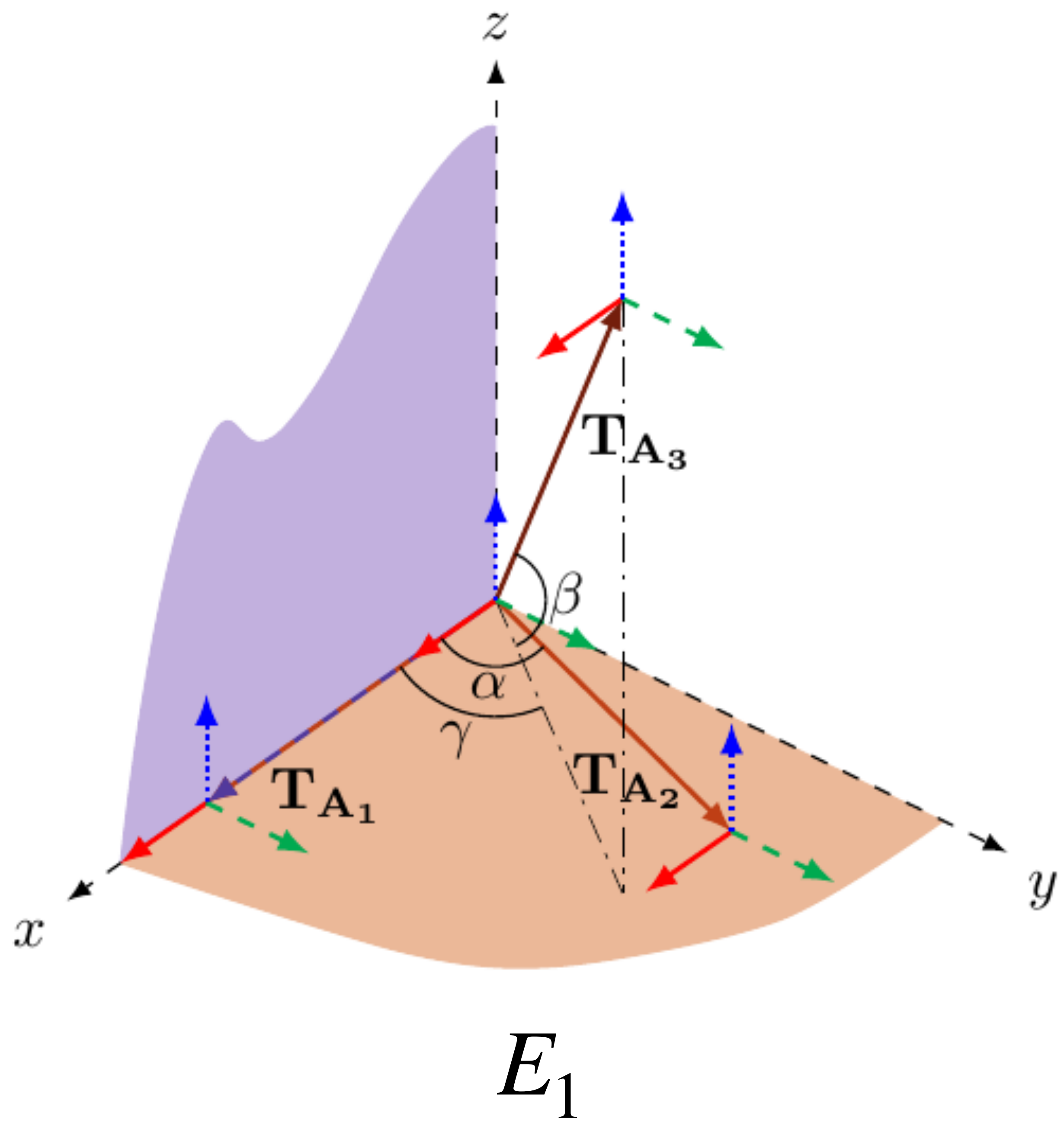


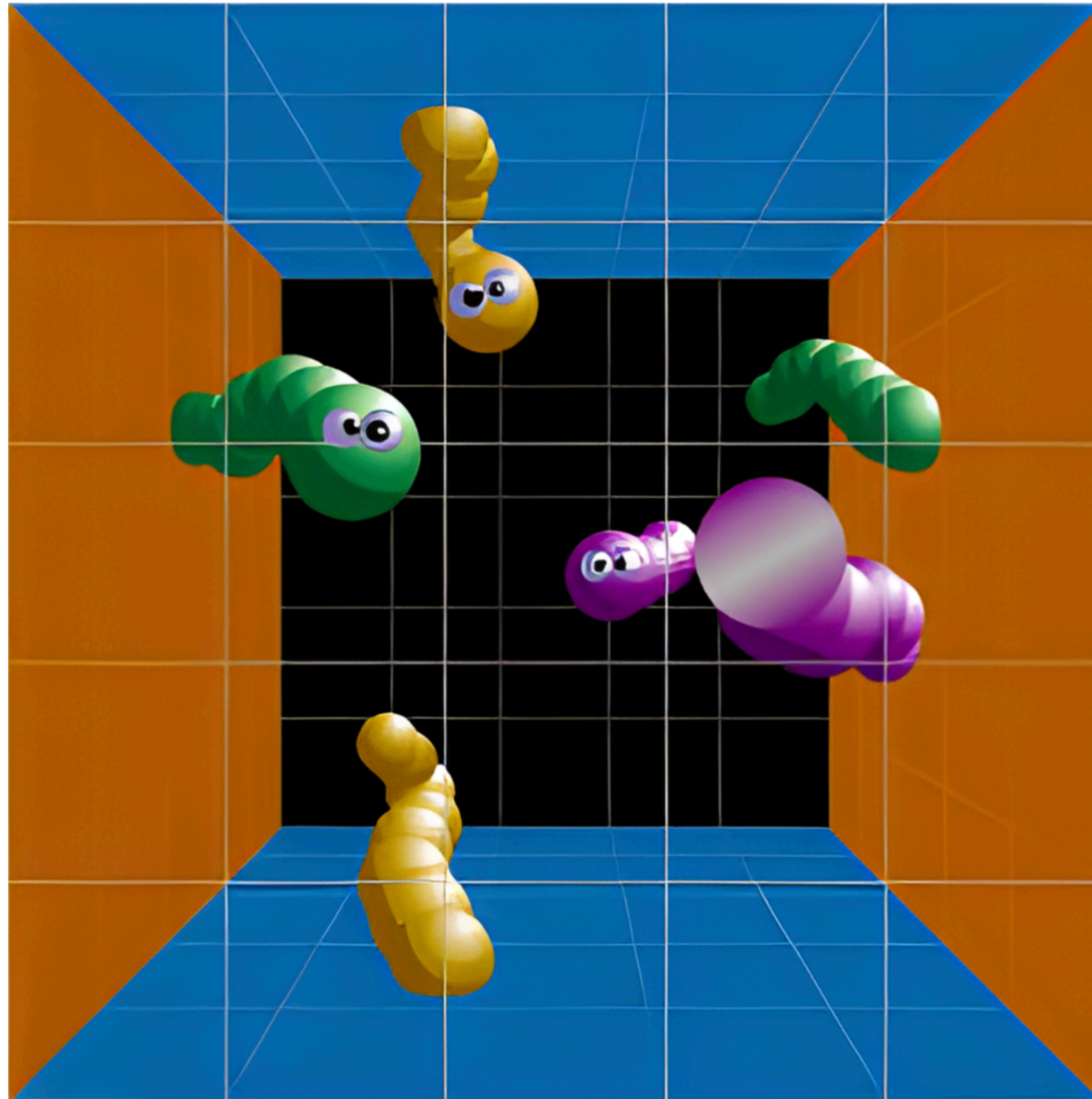




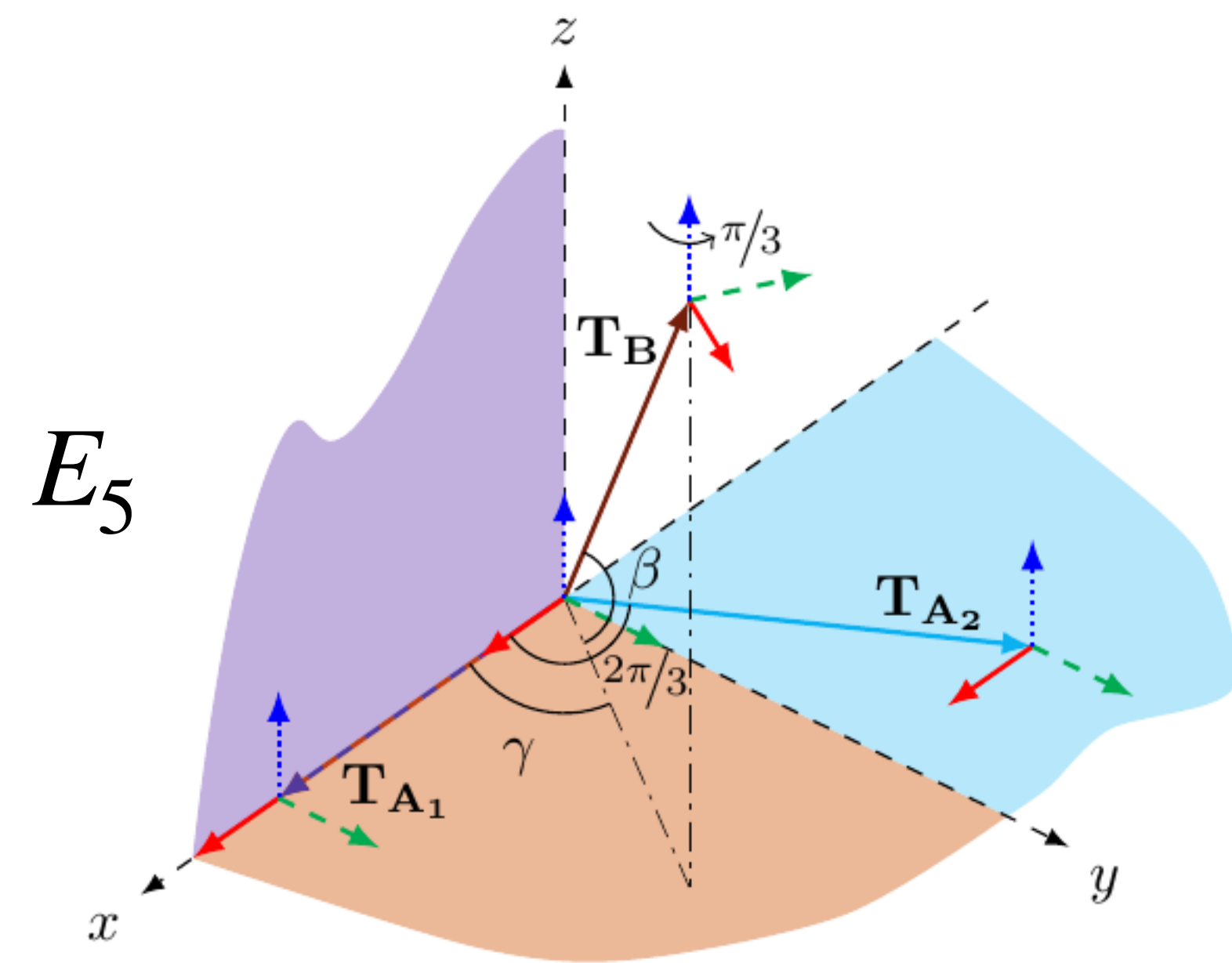
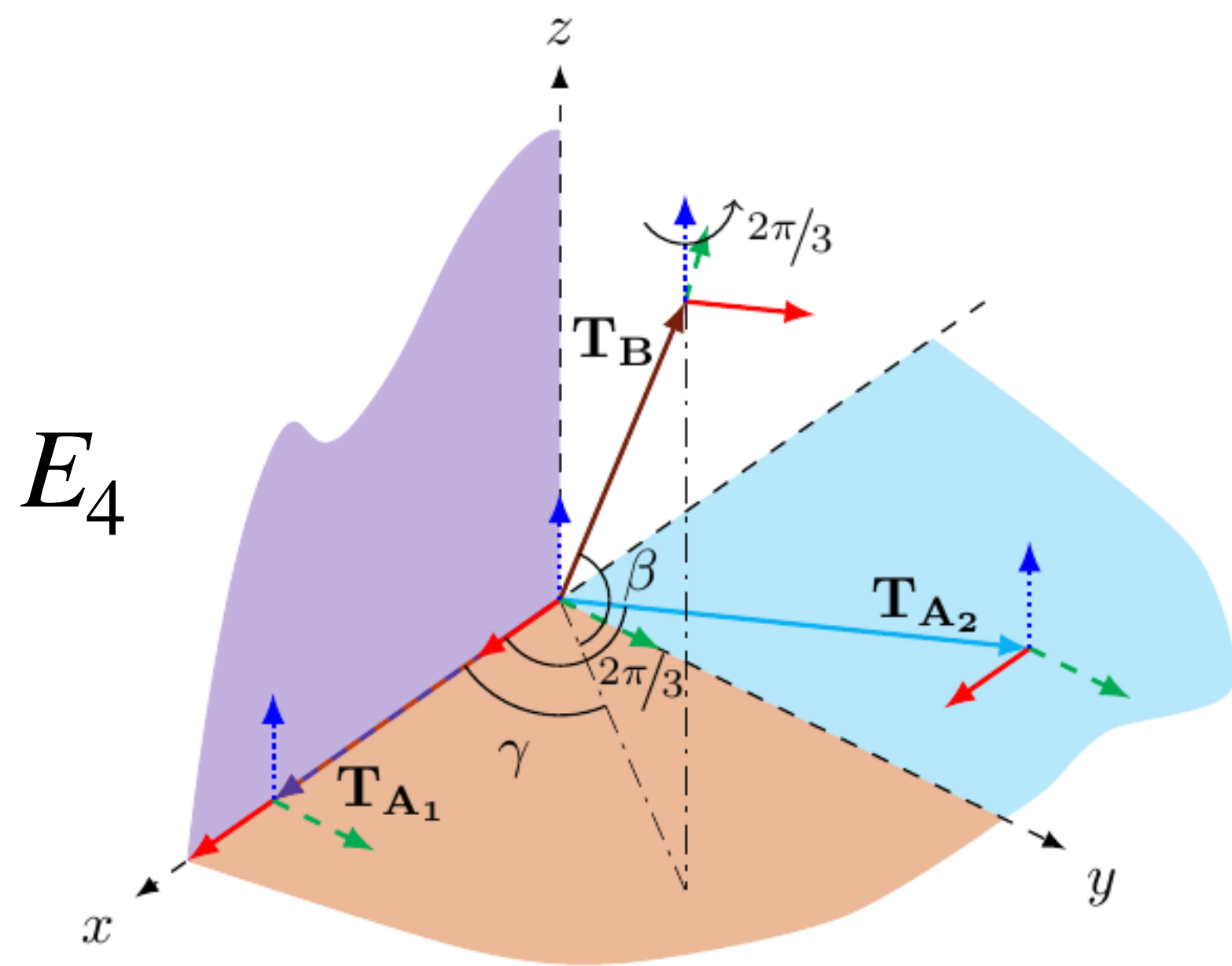
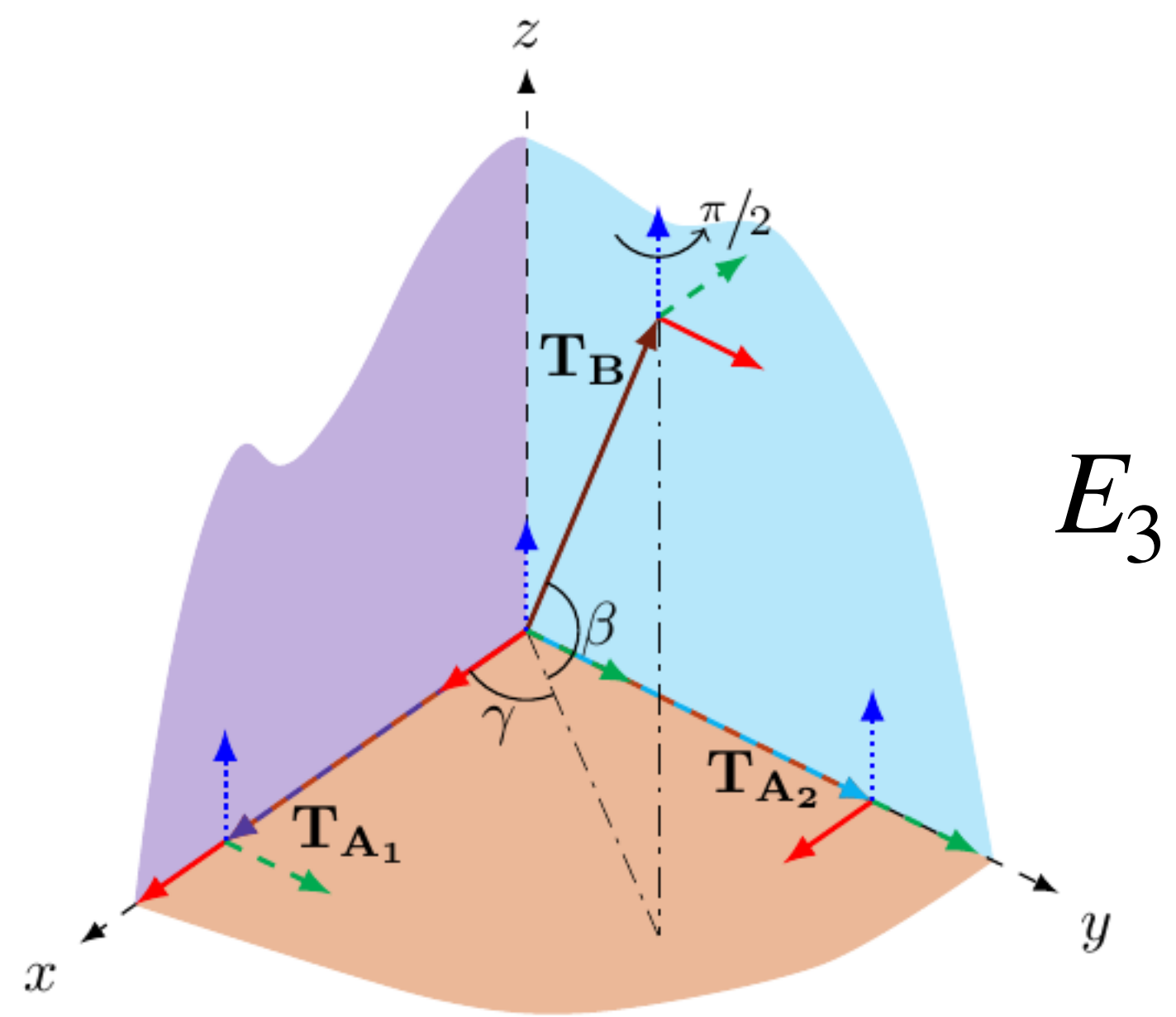
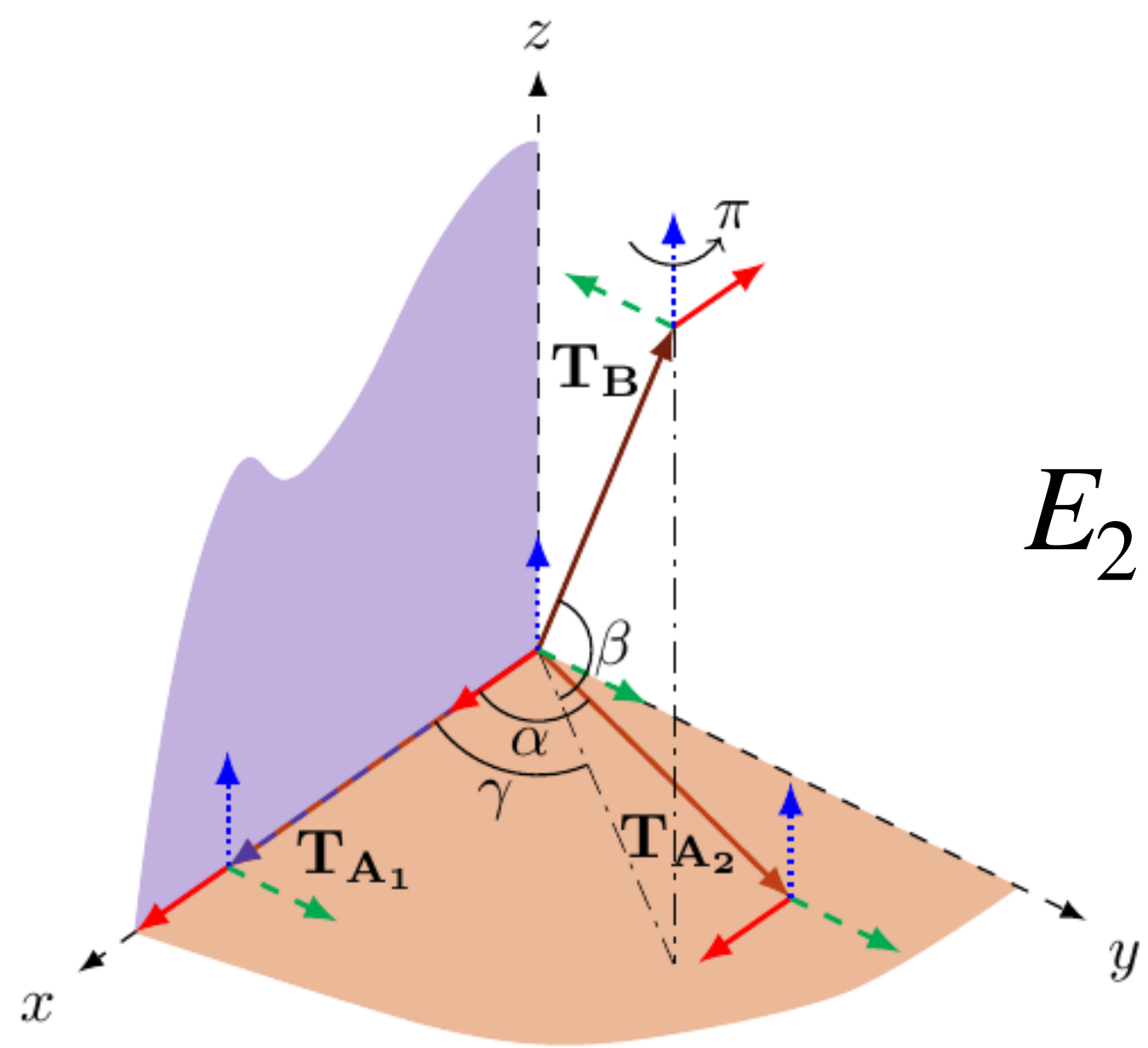
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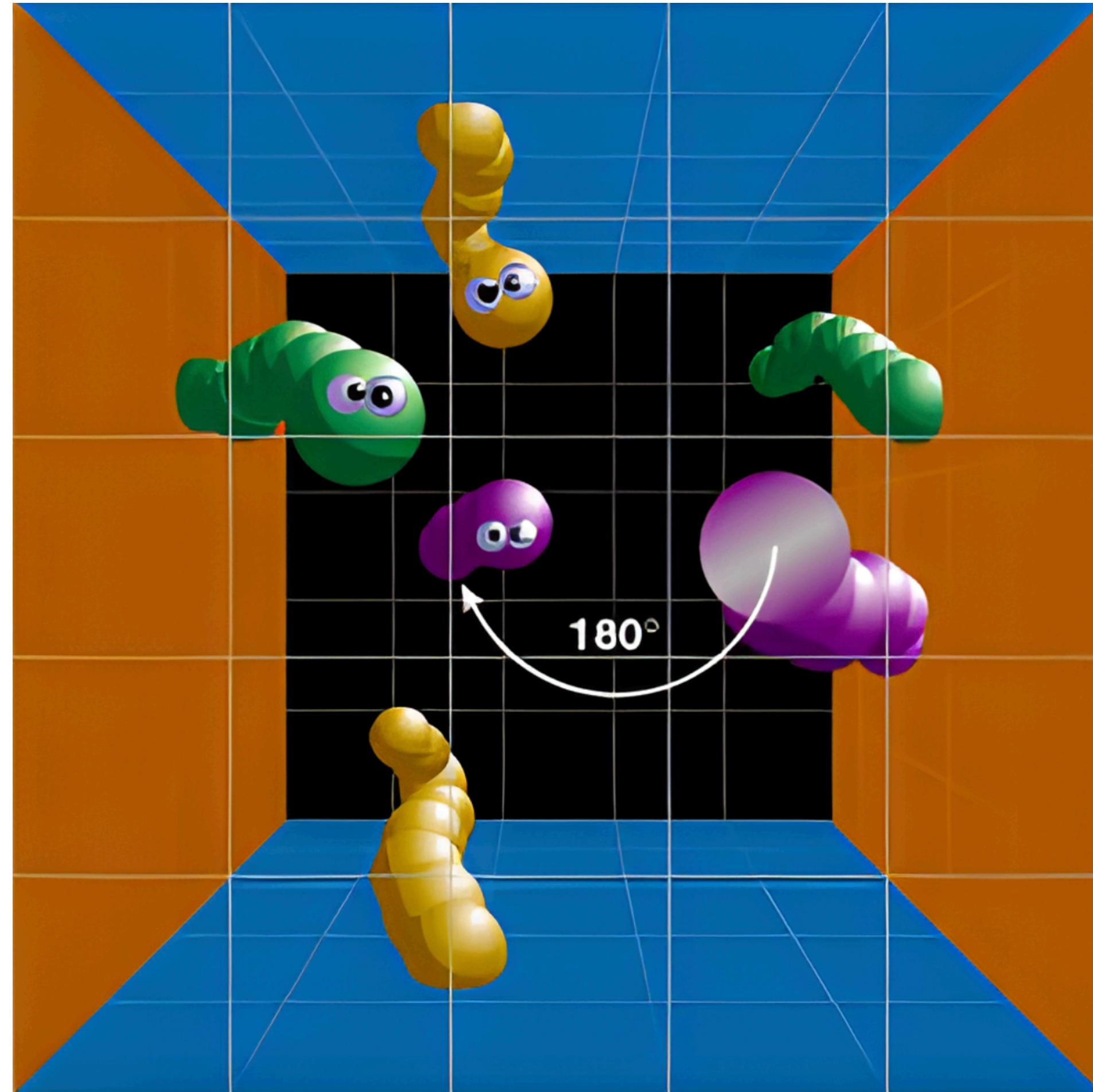






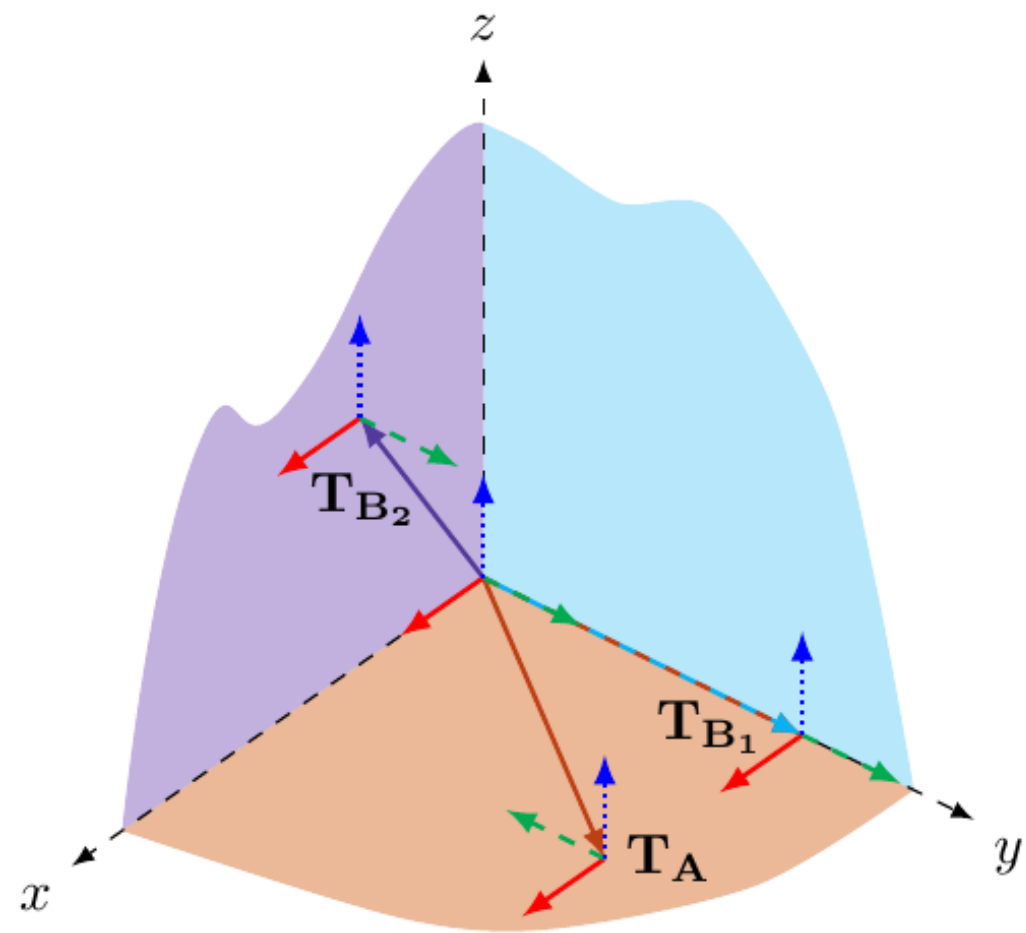
E_1



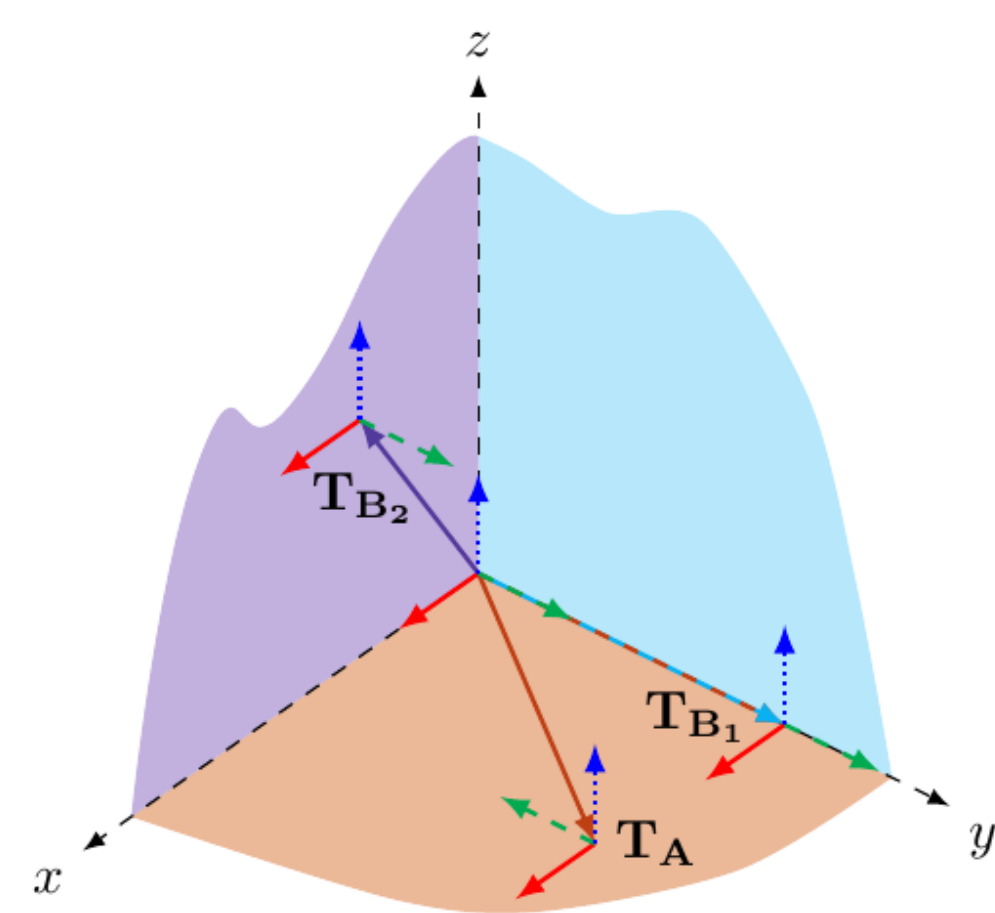


E_2

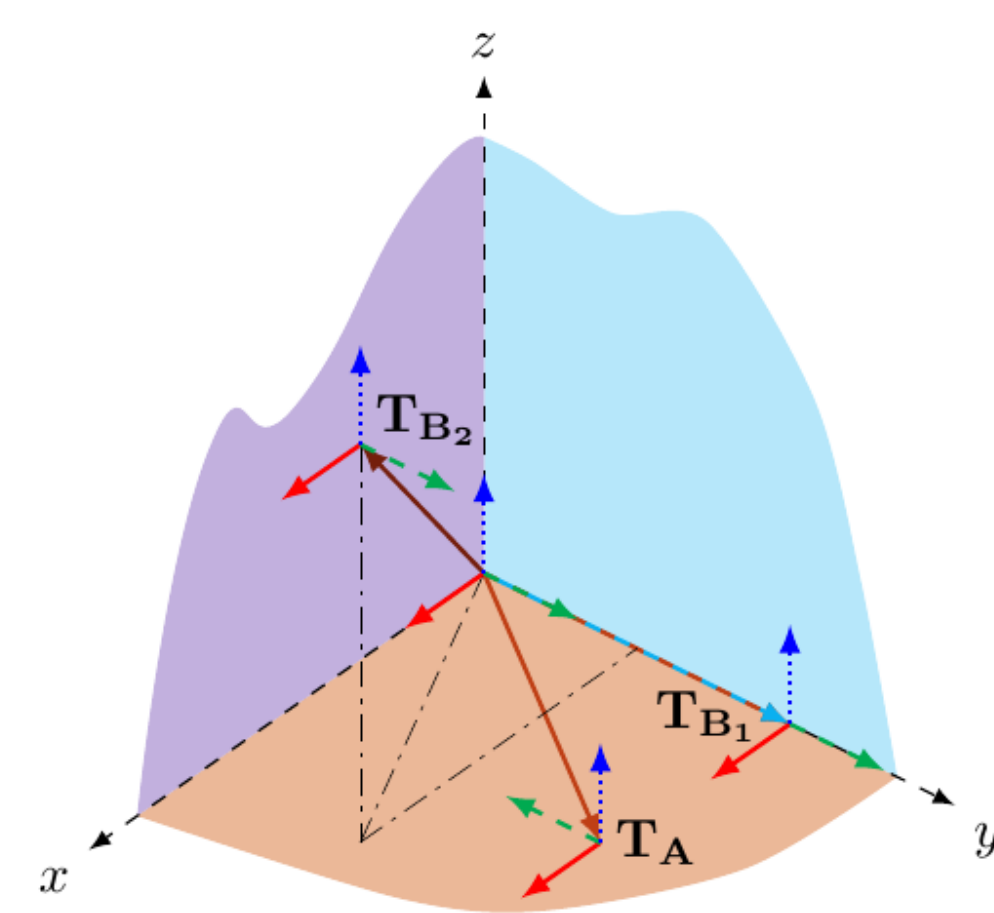
Klein topologies



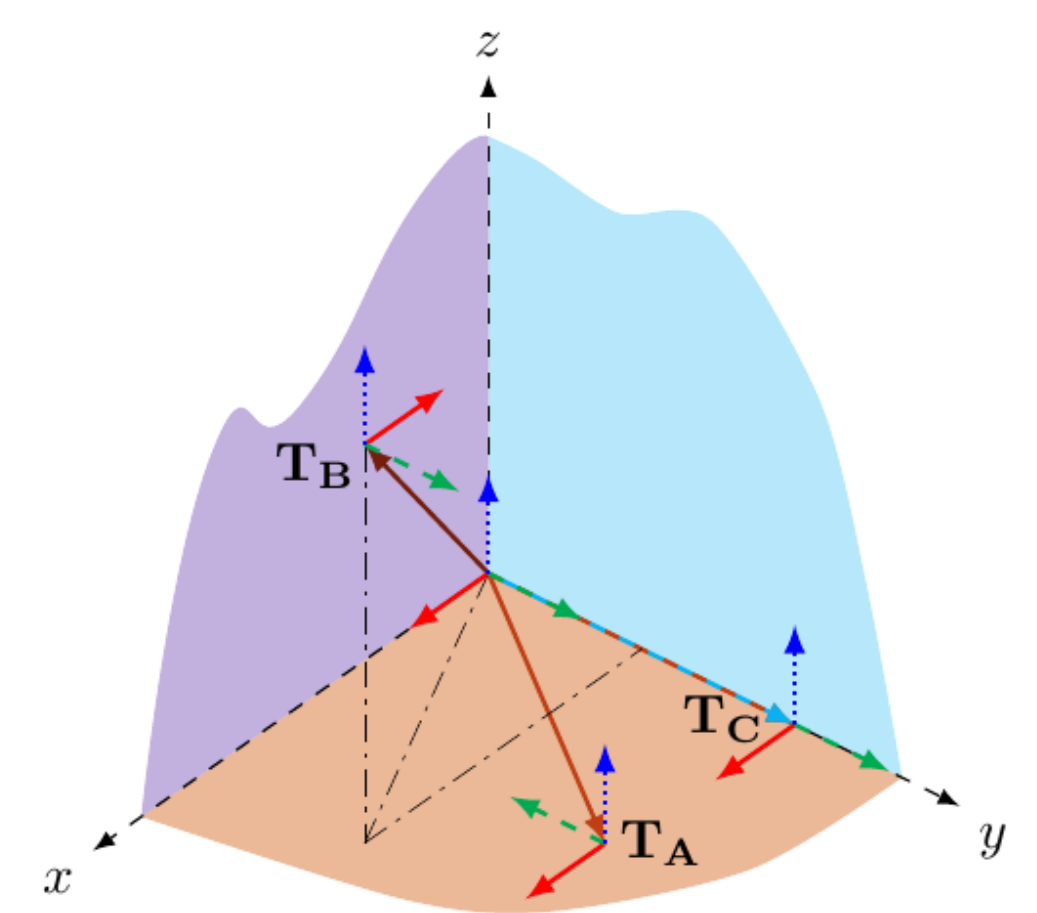
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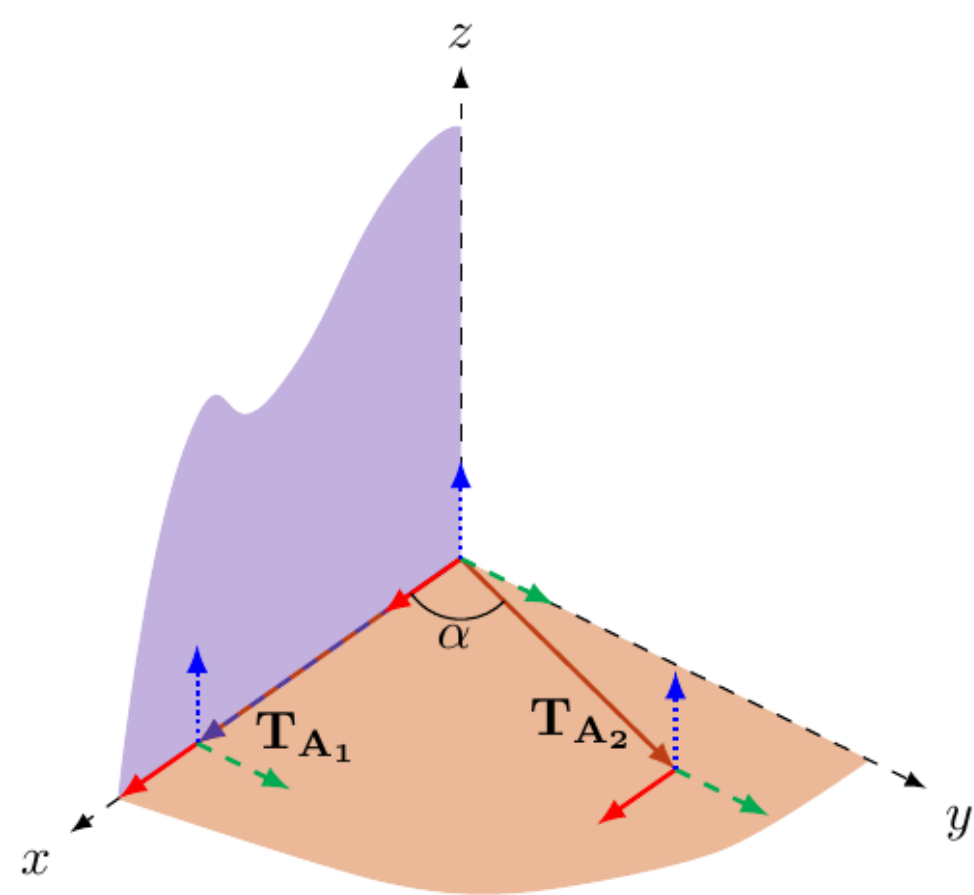
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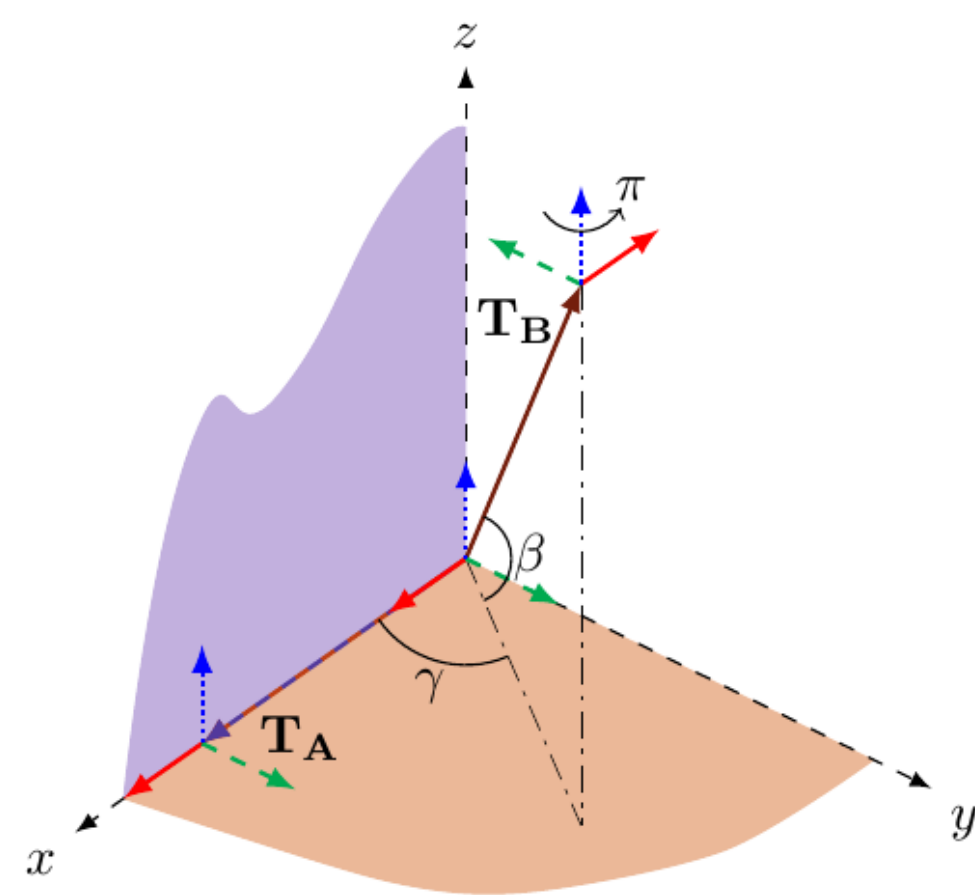
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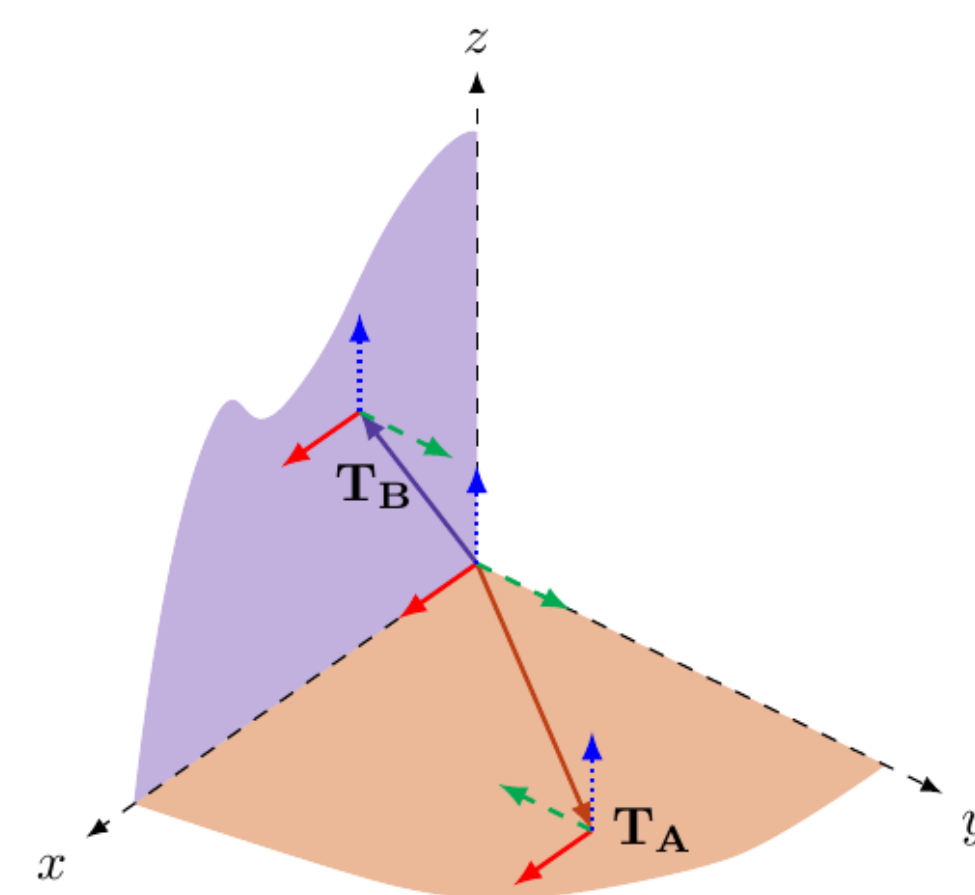
E_{10}



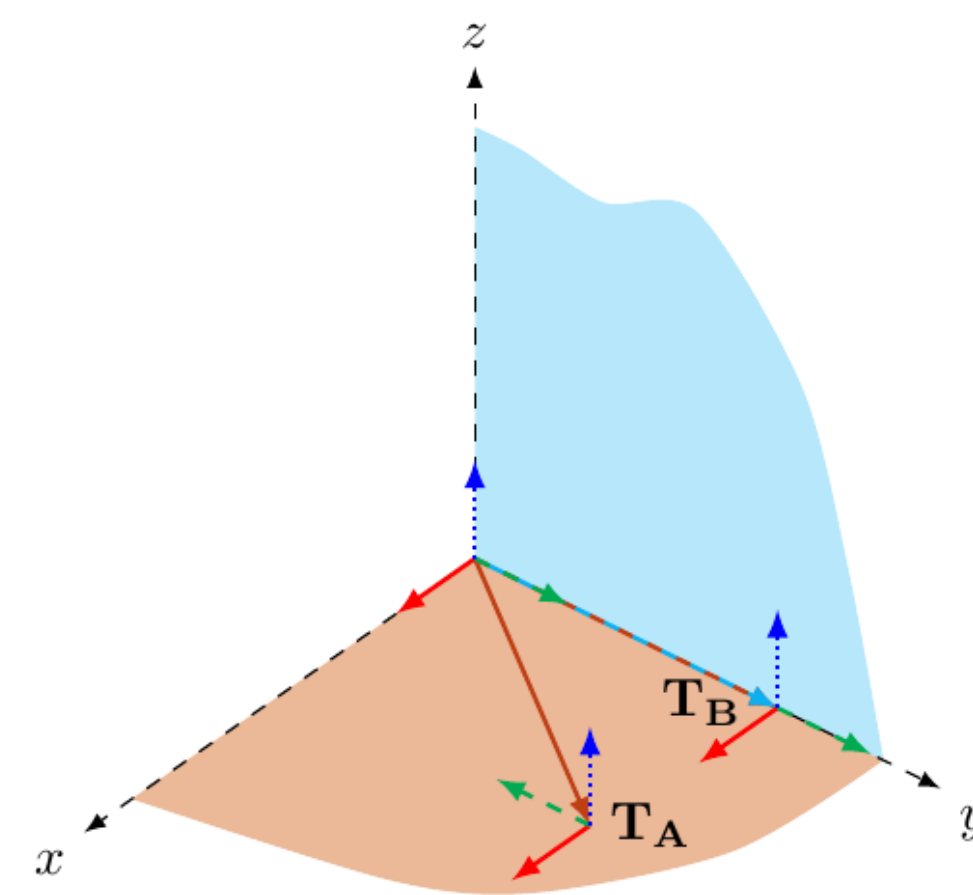
E_{11}



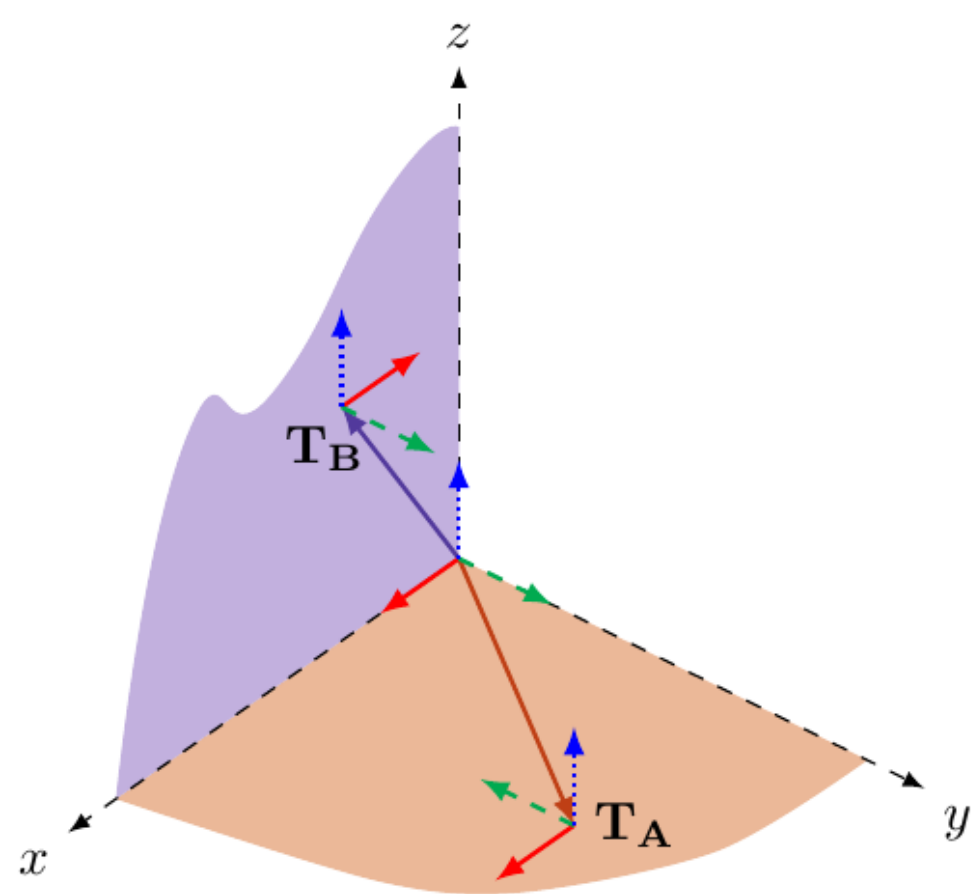
E_{12}



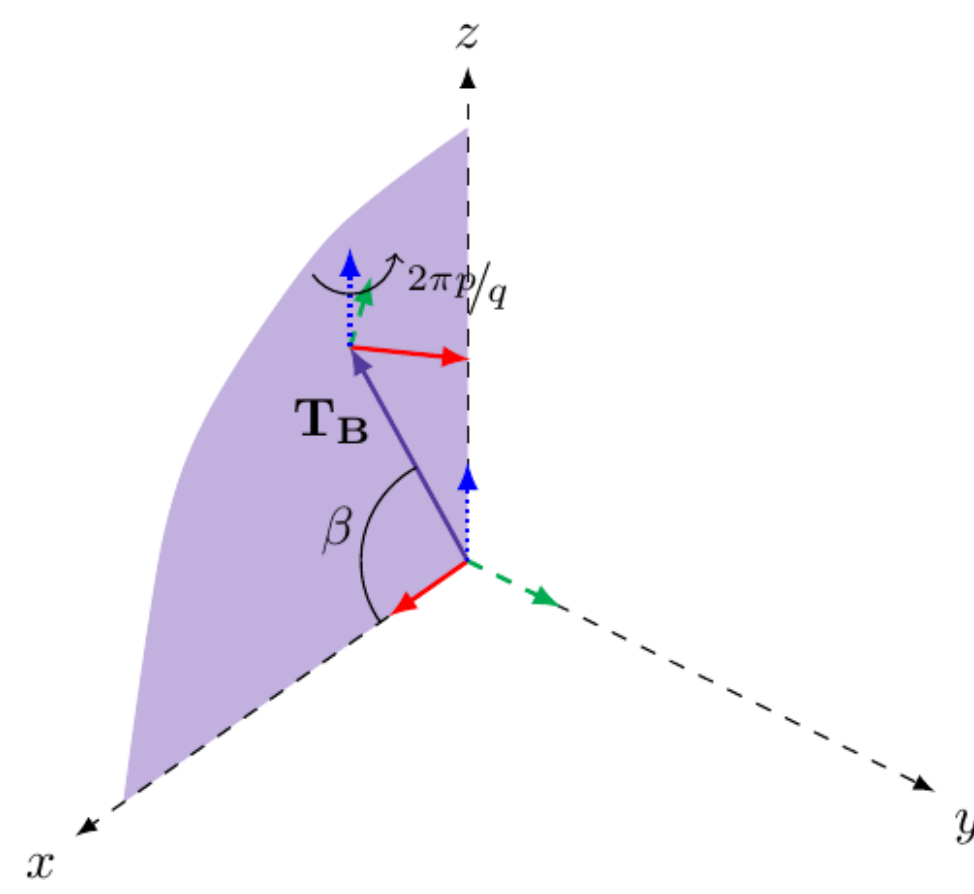
E_{13}



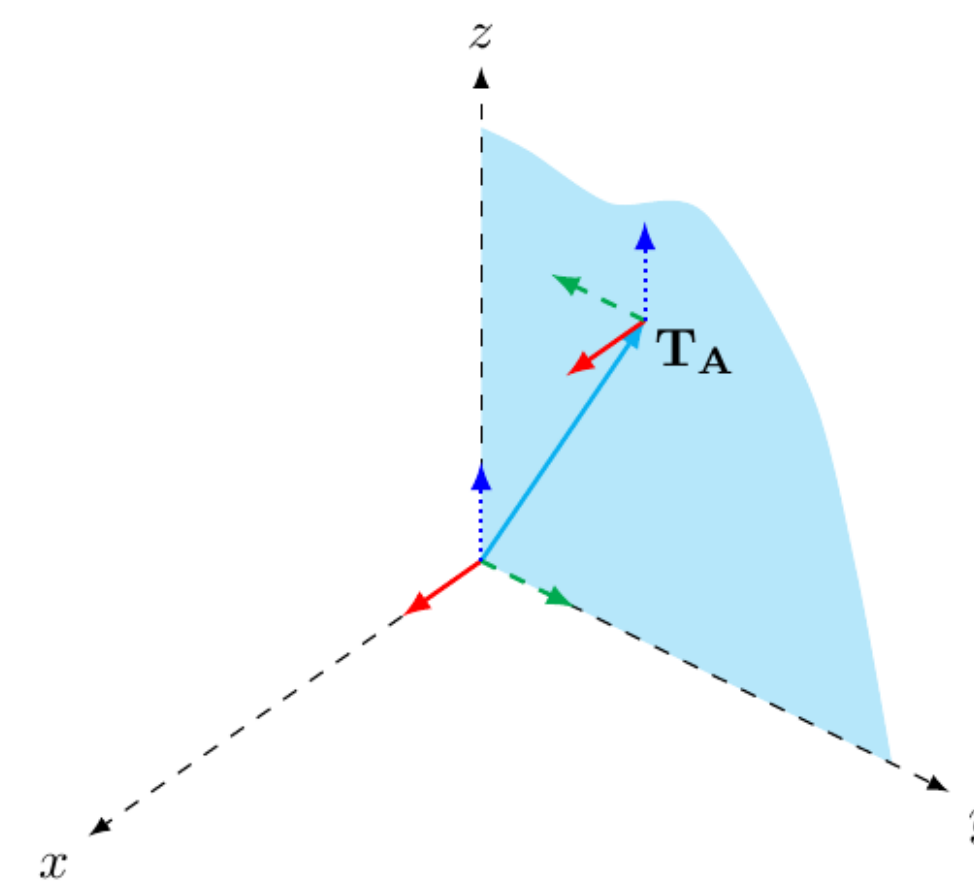
E_{14}



E_{15}

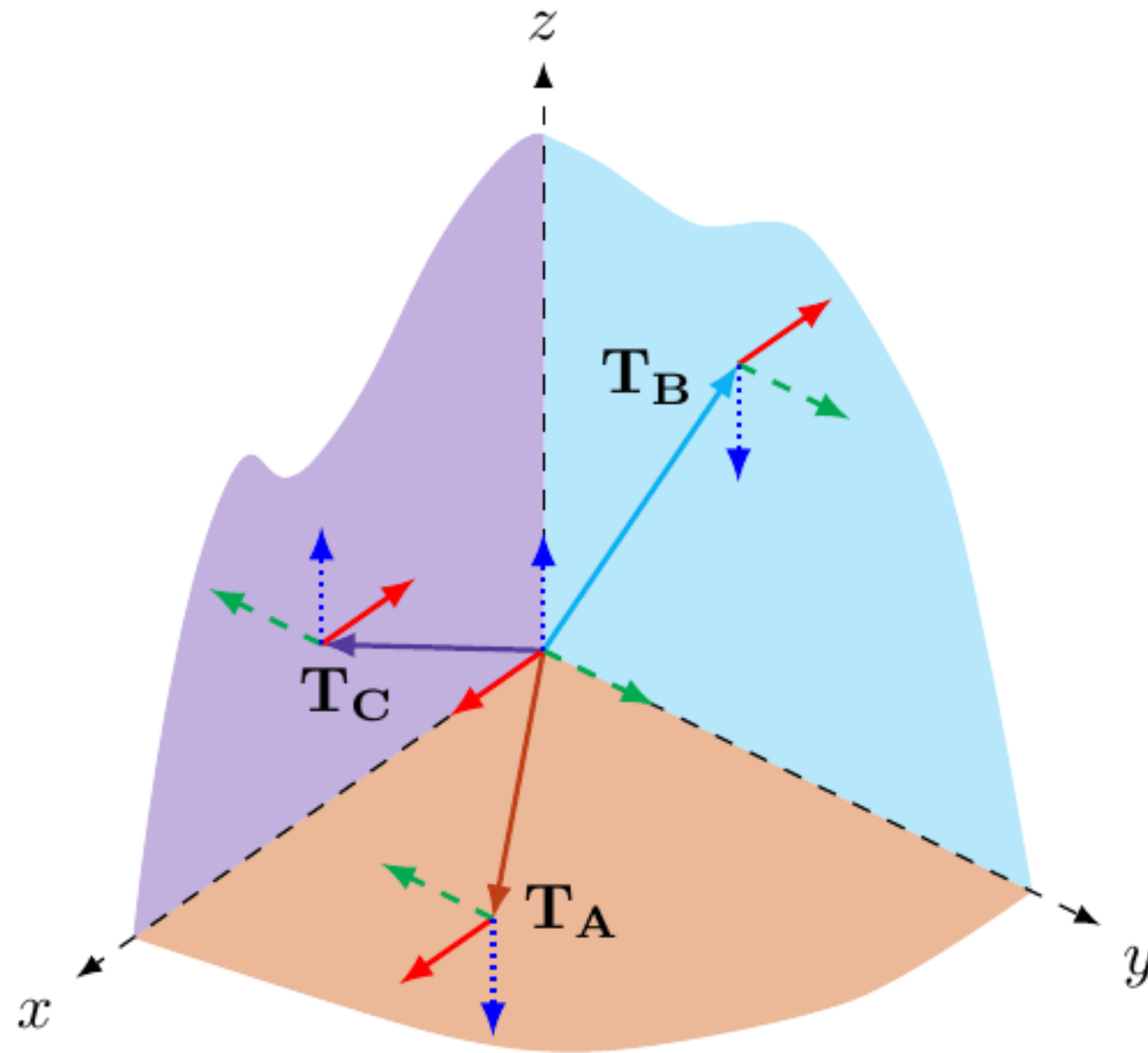


E_{16i}



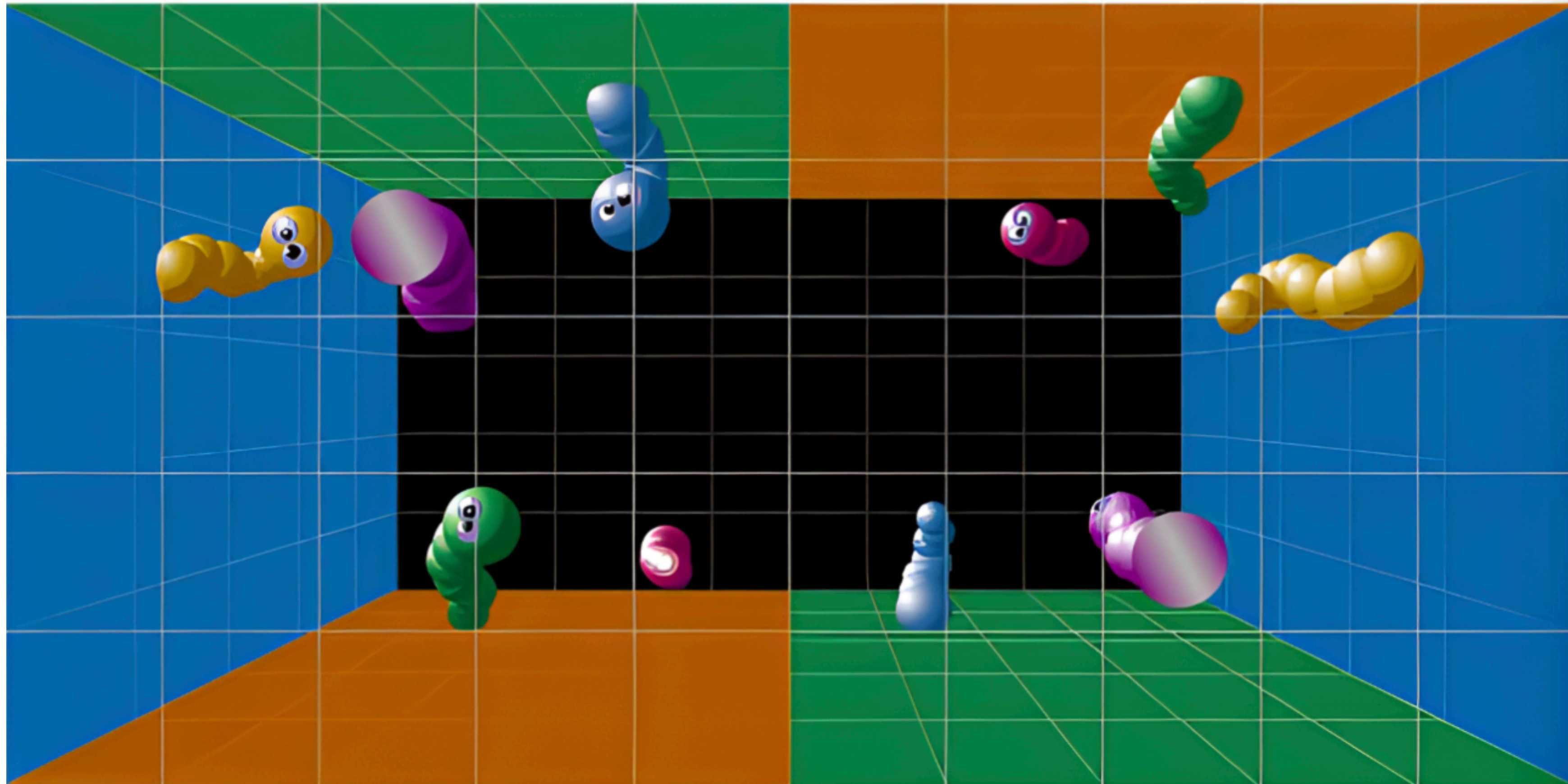
E_{17}

Hantzsche-Wendt topology



E_6

Hantzsche-Wendt topology



E_6

Classification of topologies

Classification of topologies



ORIENTABLE

Classification of topologies



ORIENTABLE



FINITE

Classification of topologies



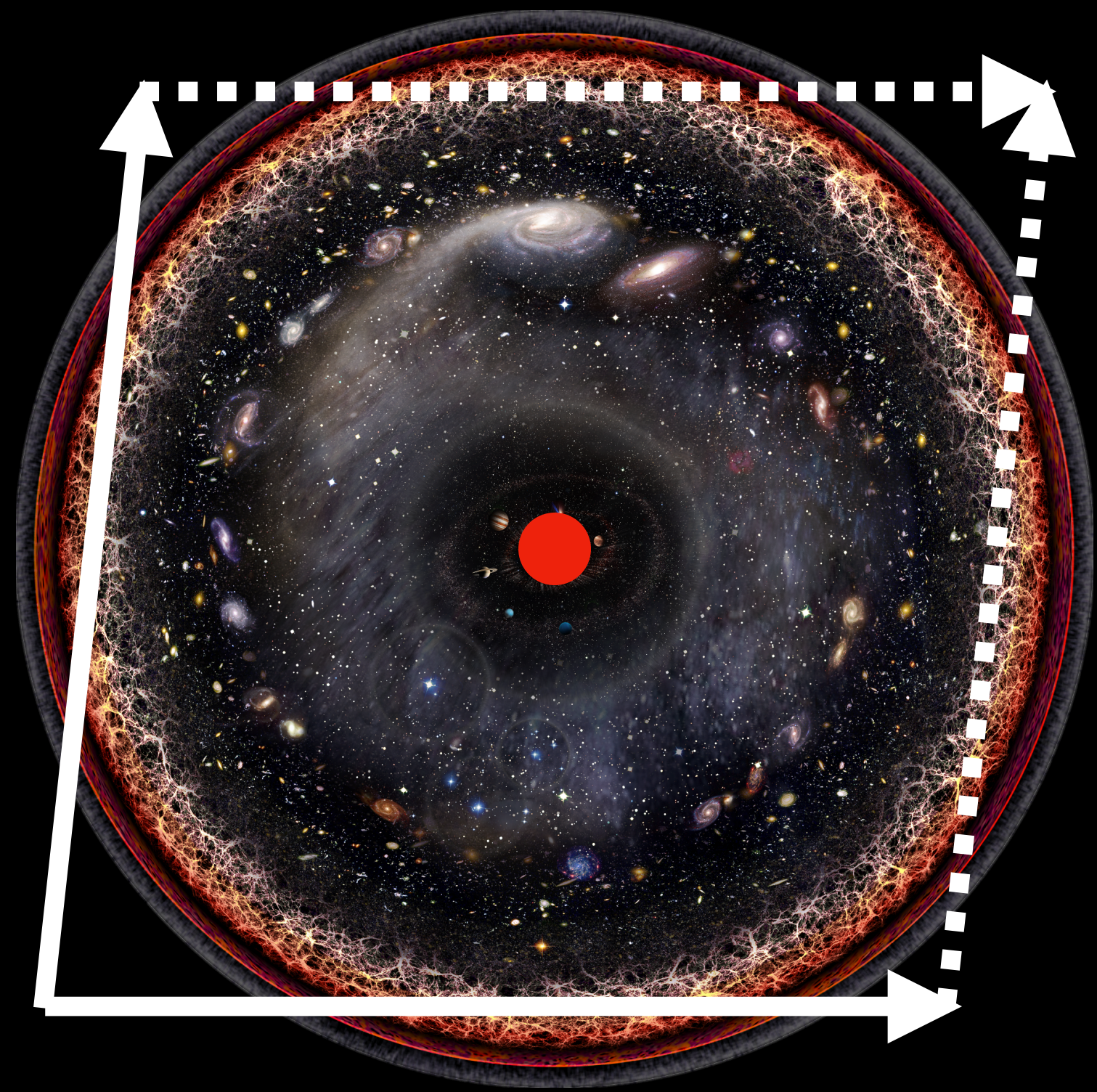
ORIENTABLE



FINITE



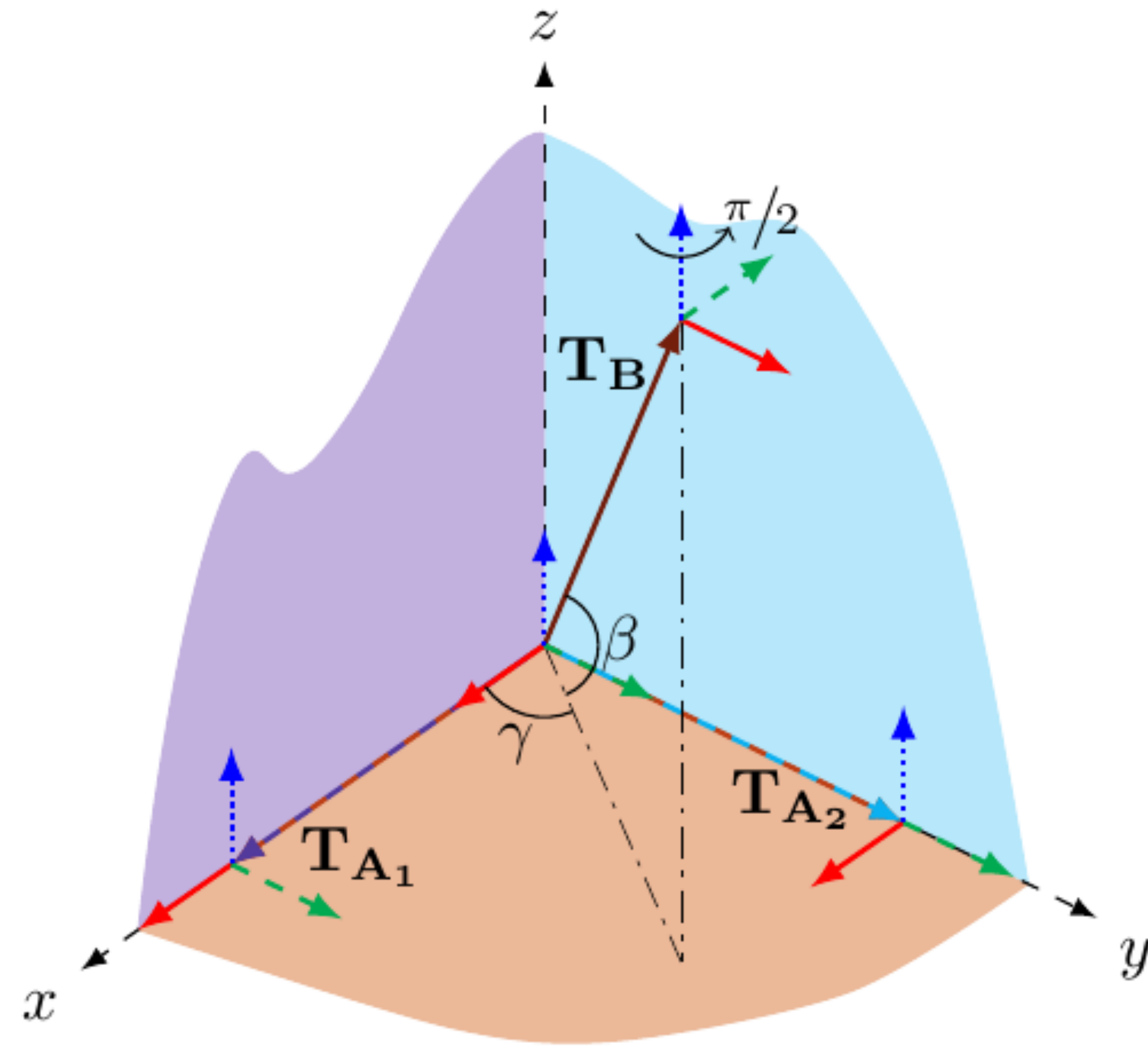
HOMOGENEOUS





200,000 units are ready, with a million more well on the way

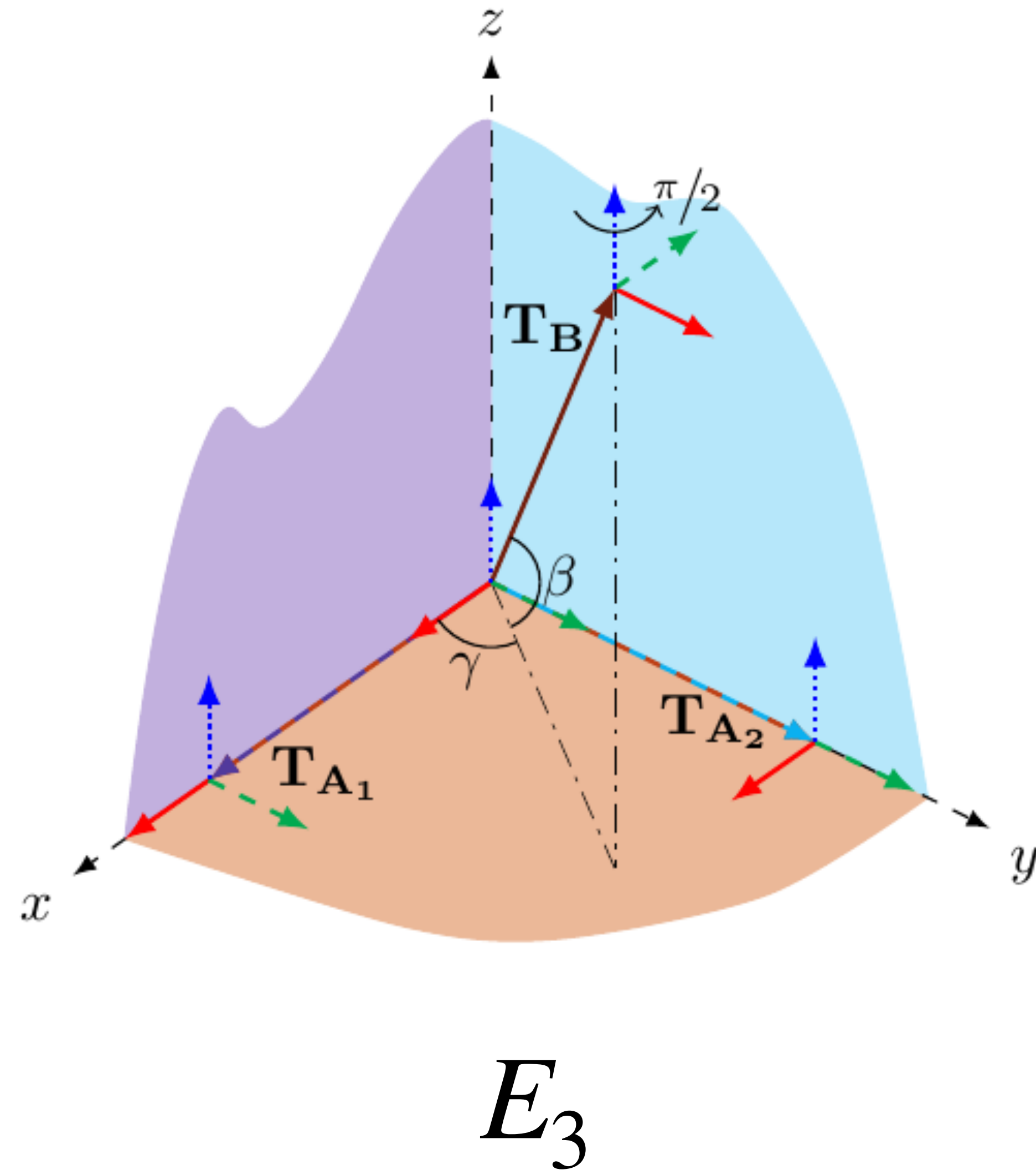
Clone search



E_3

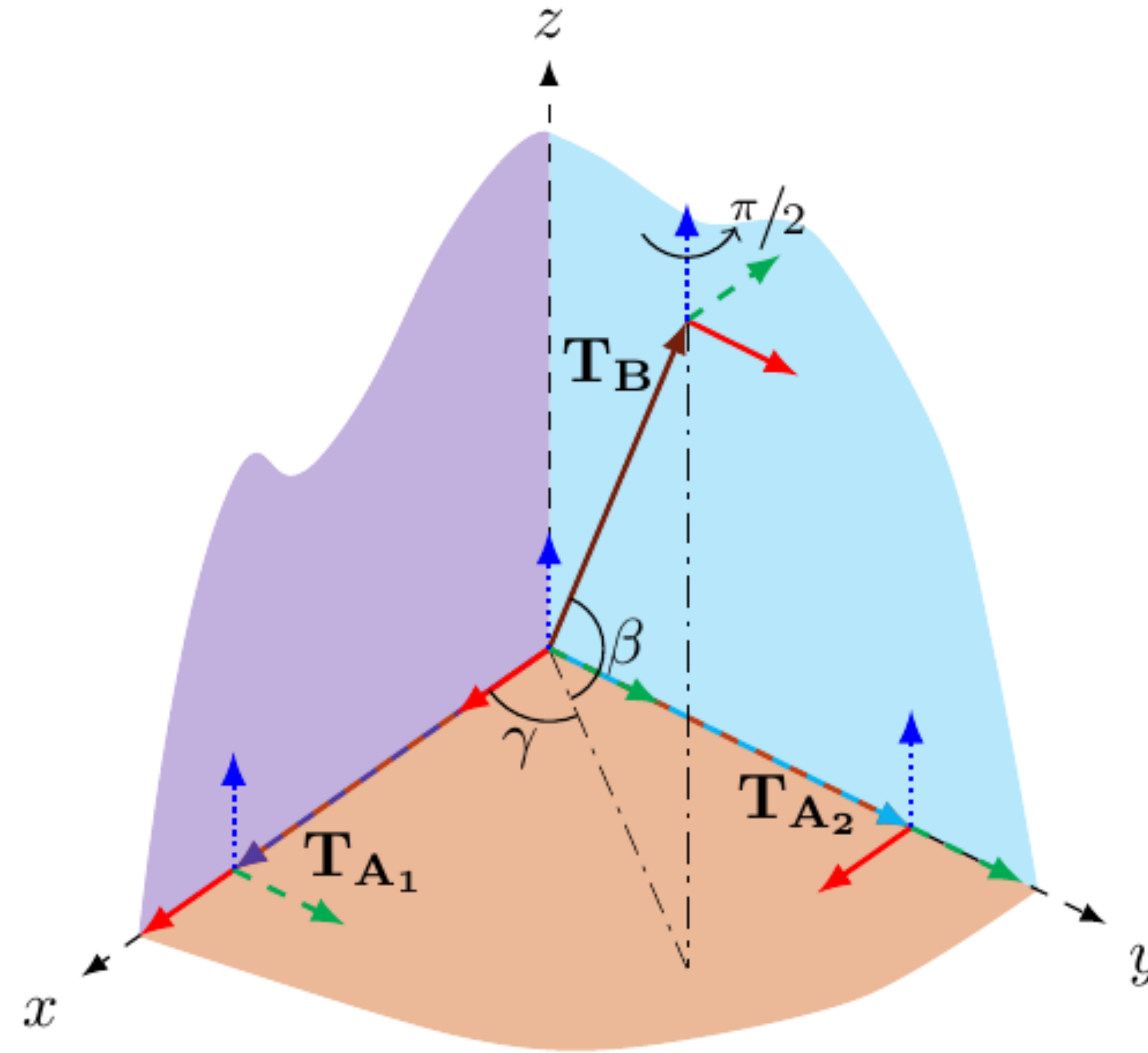
Clone search

Step 1:
Non-trivial
generators



Clone search

Step 1:
Non-trivial
generators

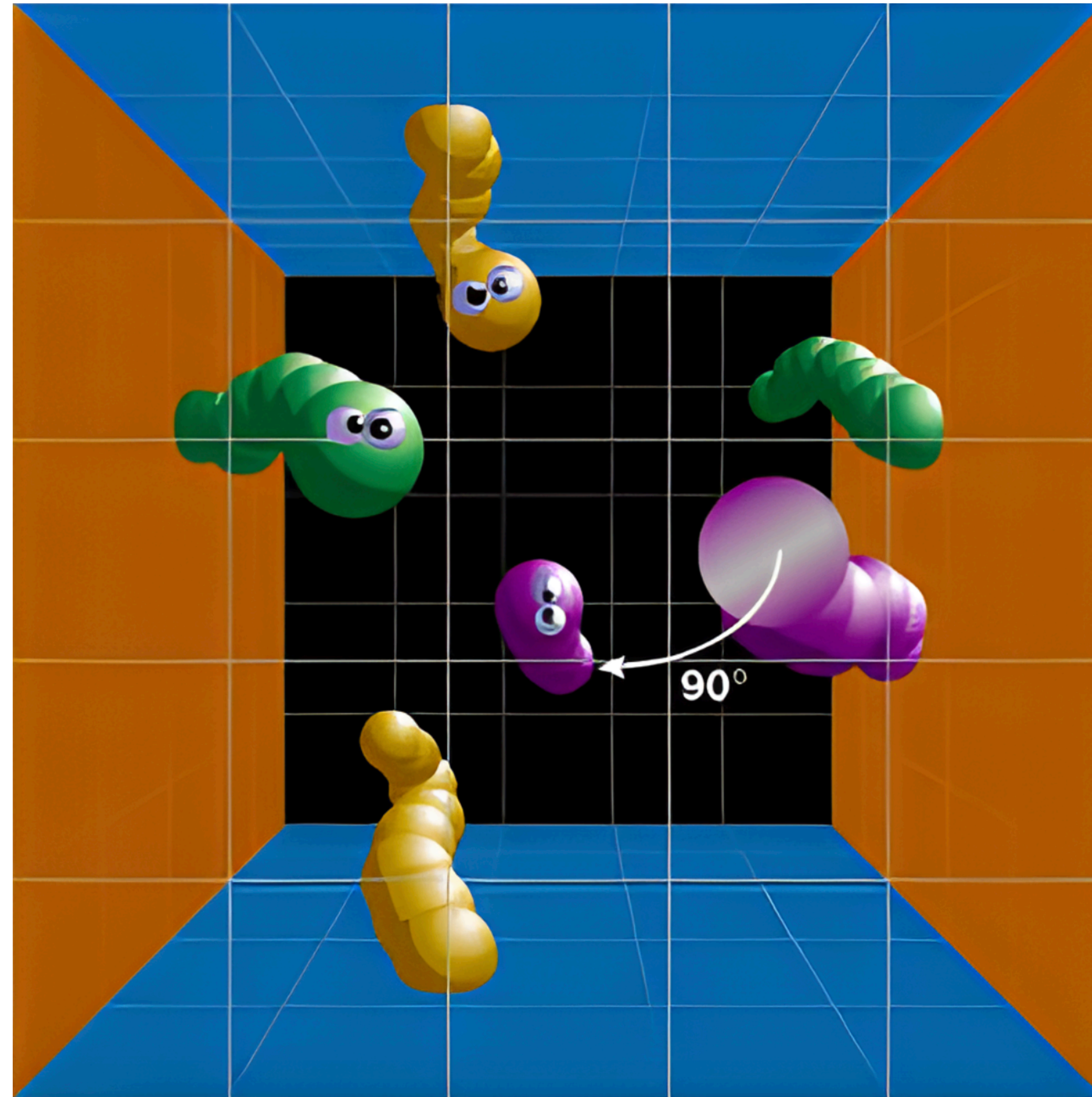


Step 2:
Pure
translations

E_3

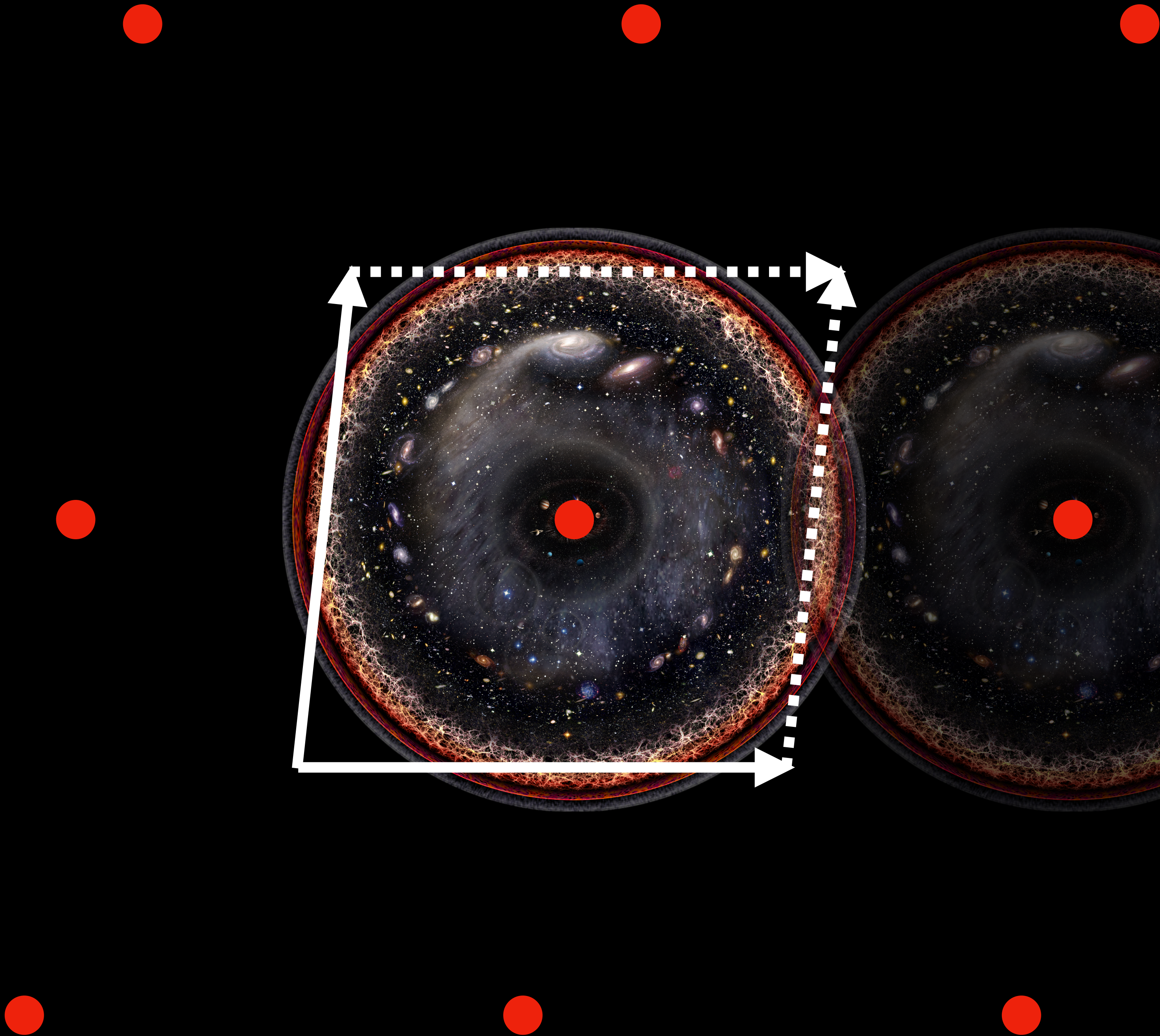
Clone search

Step 1:
Non-trivial
generators



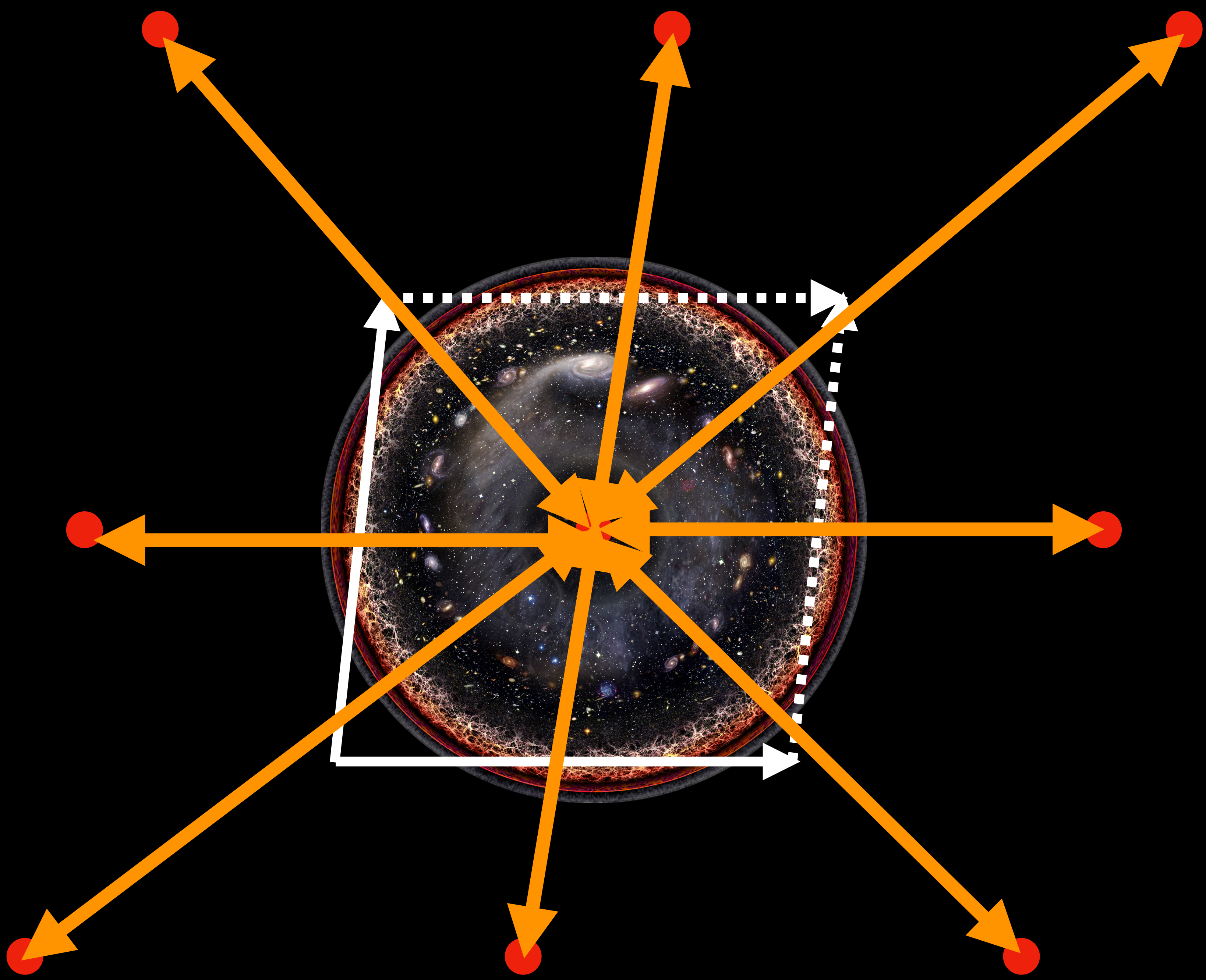
Step 2:
Pure
translations

E_3

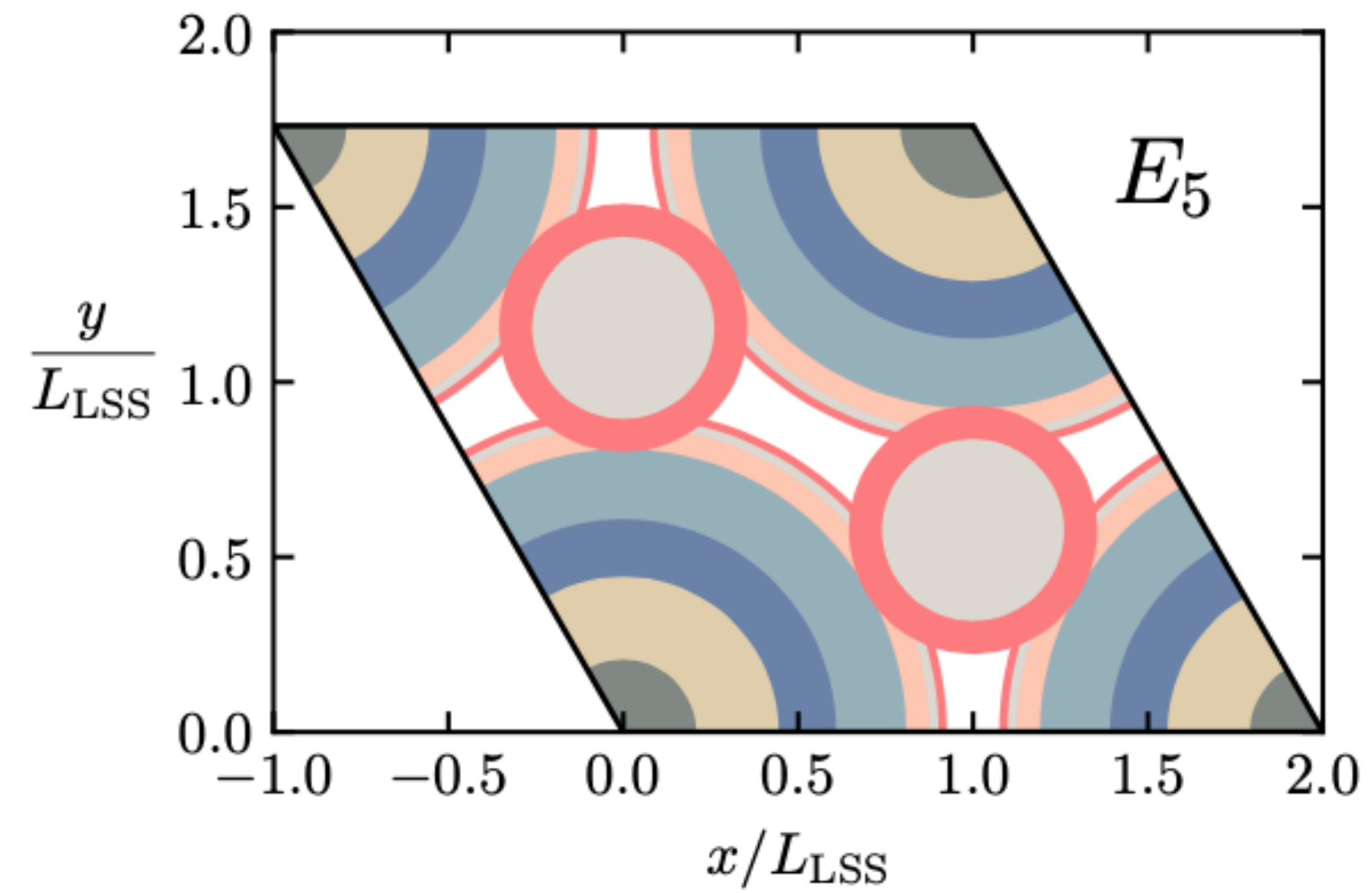
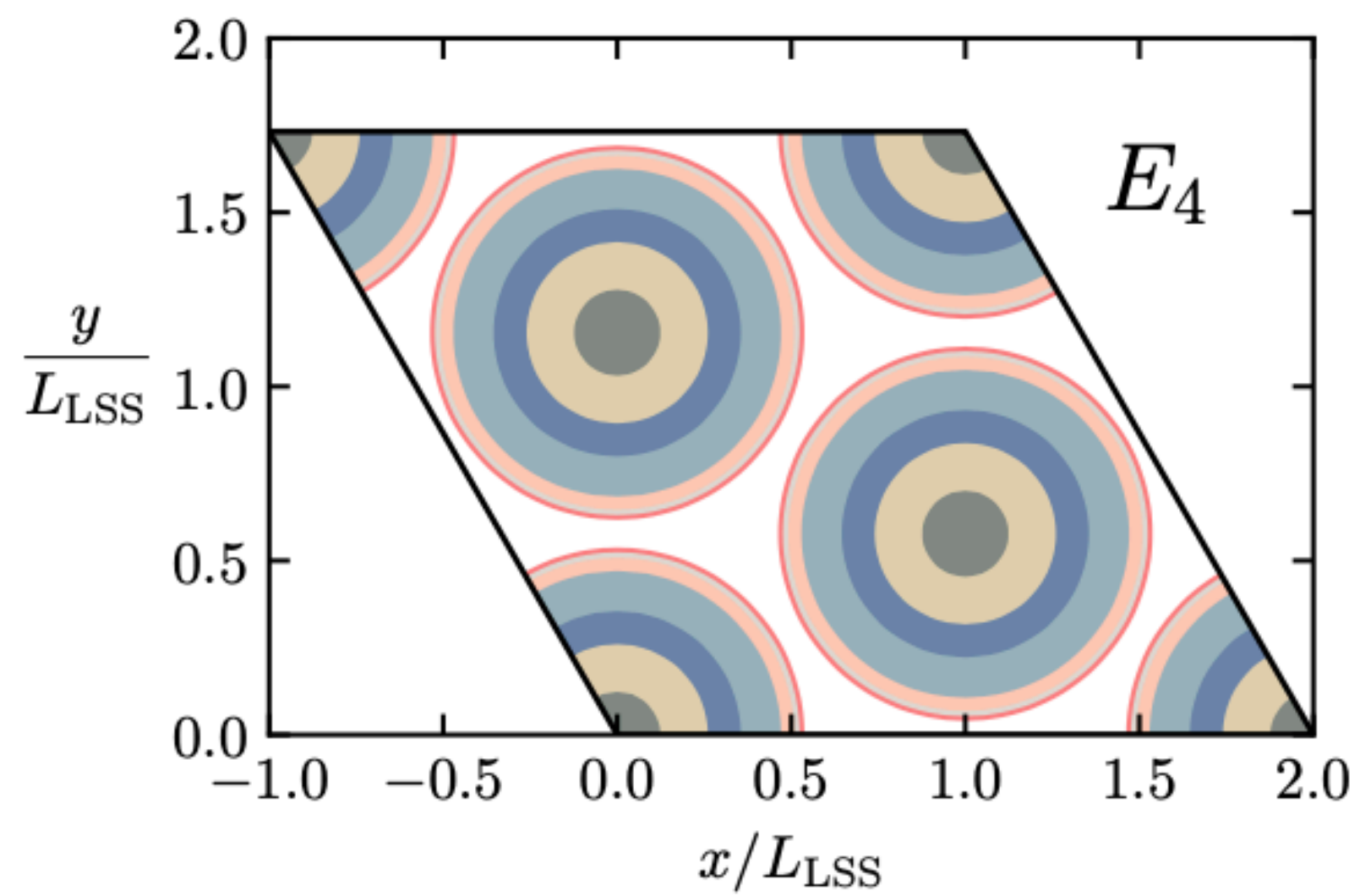
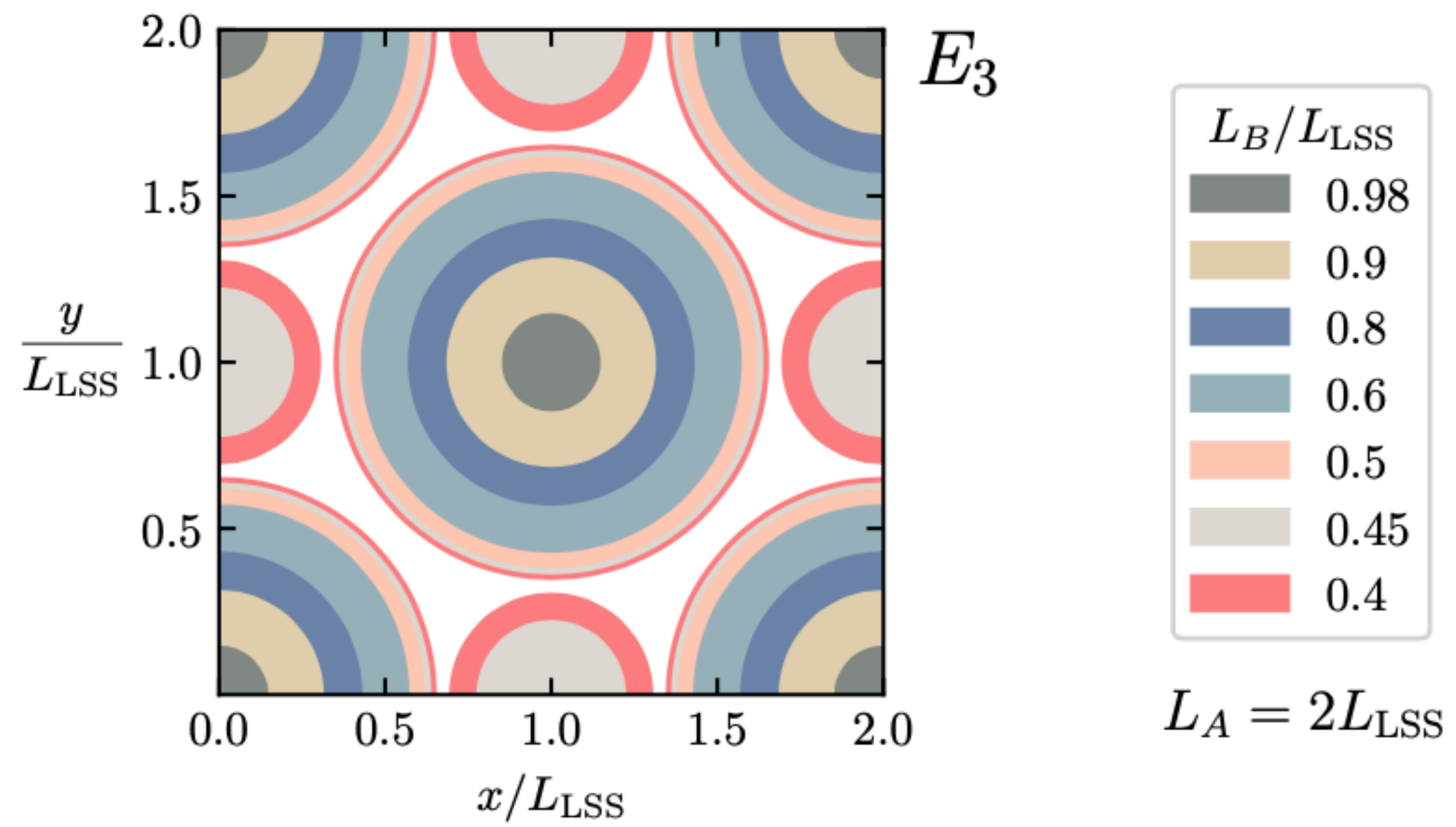


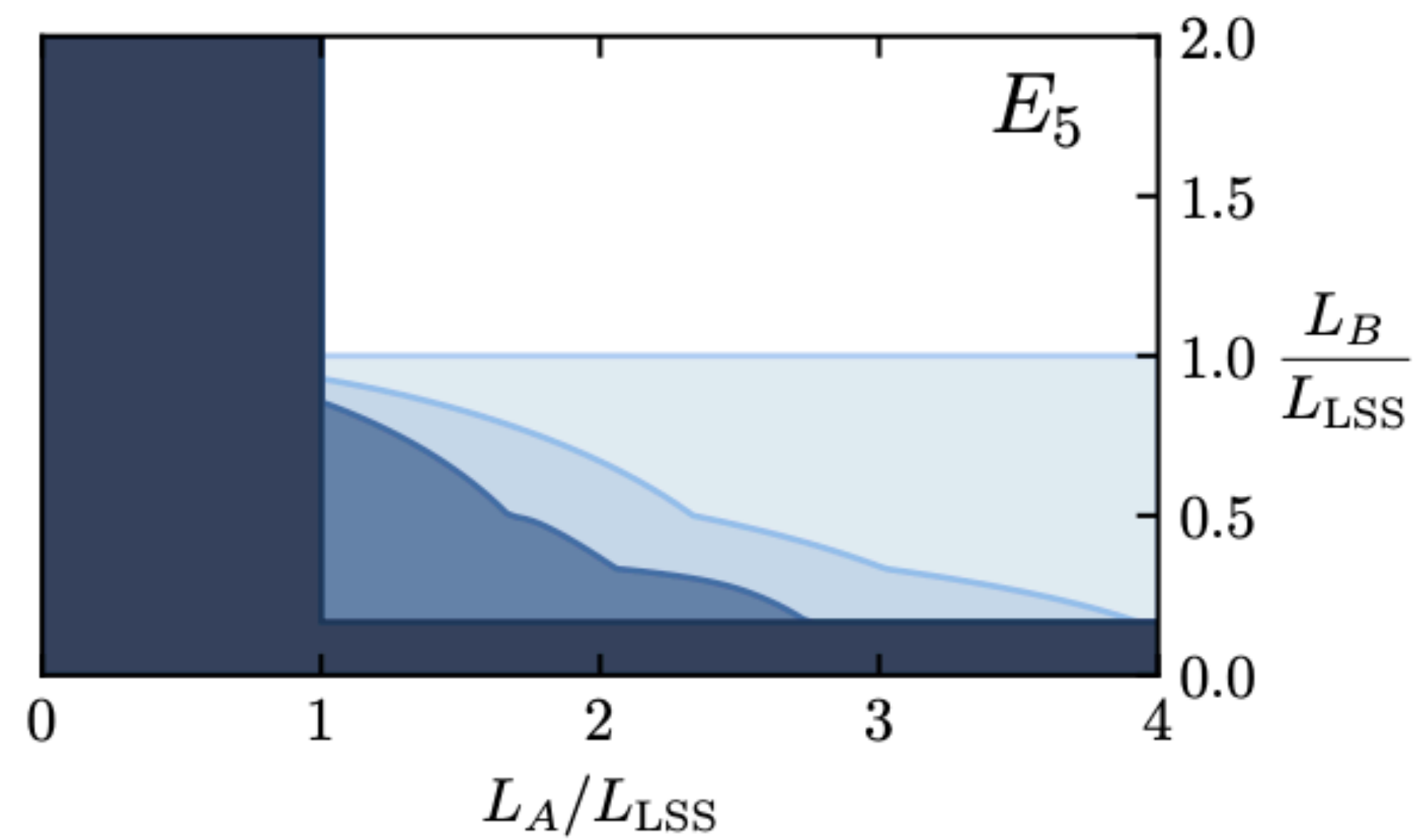
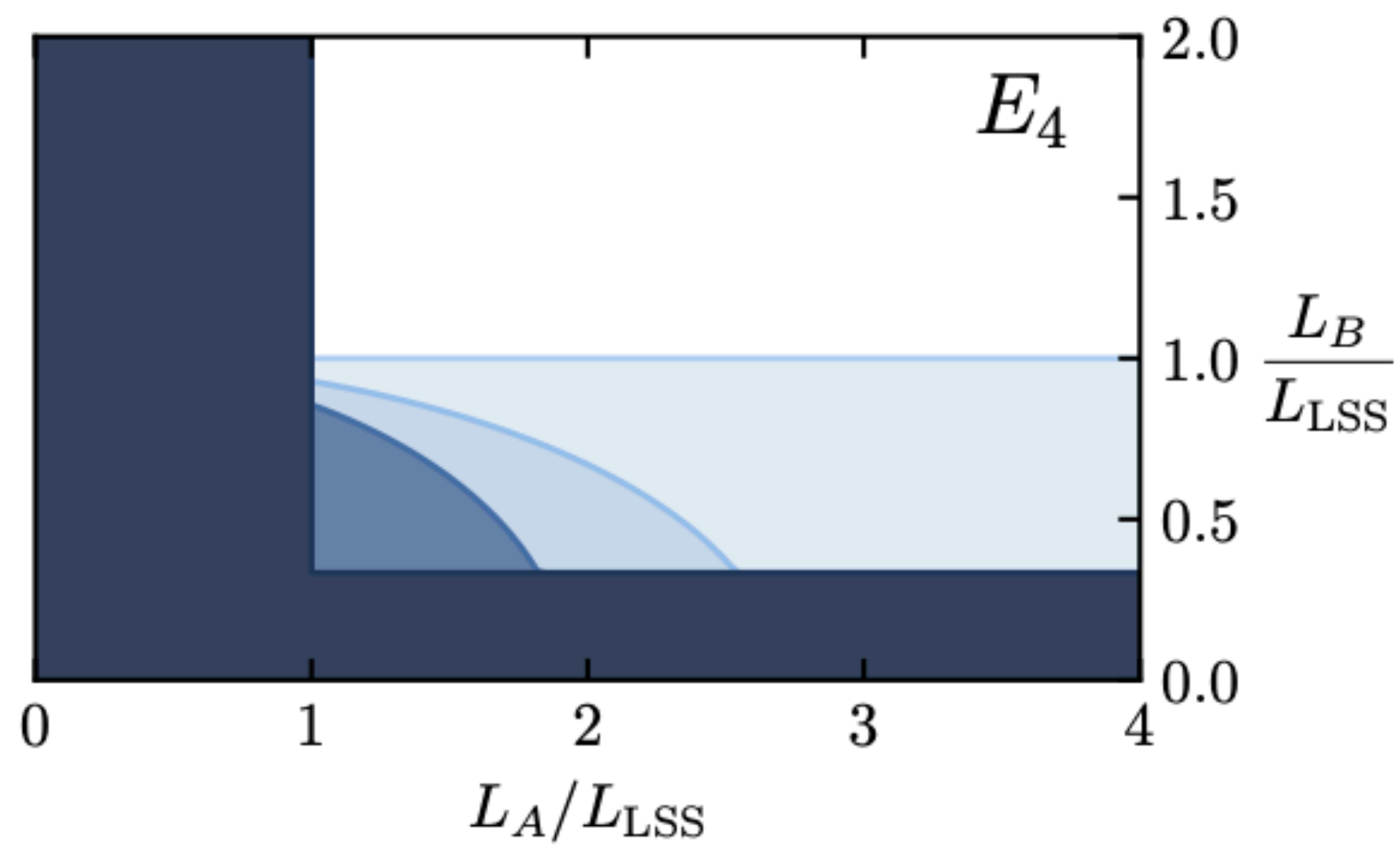
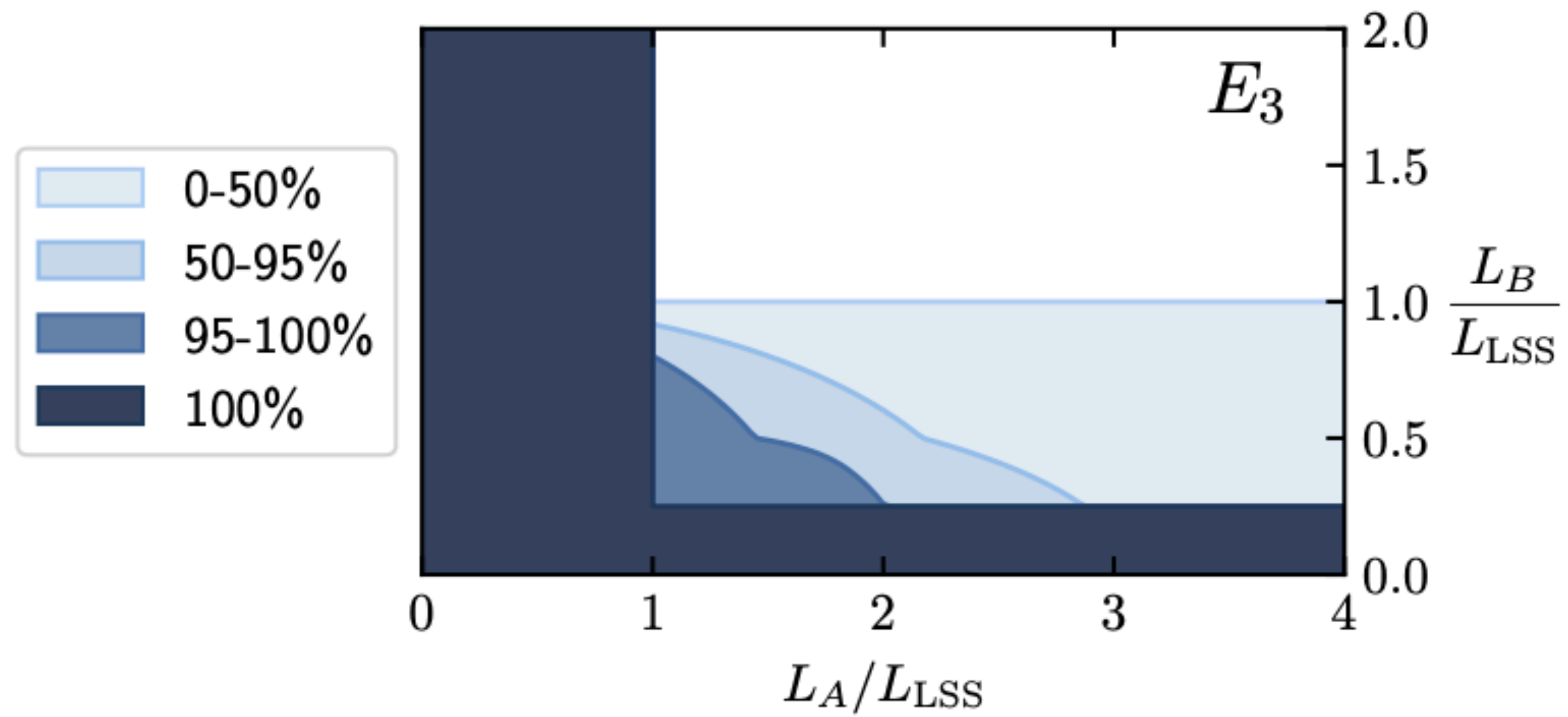


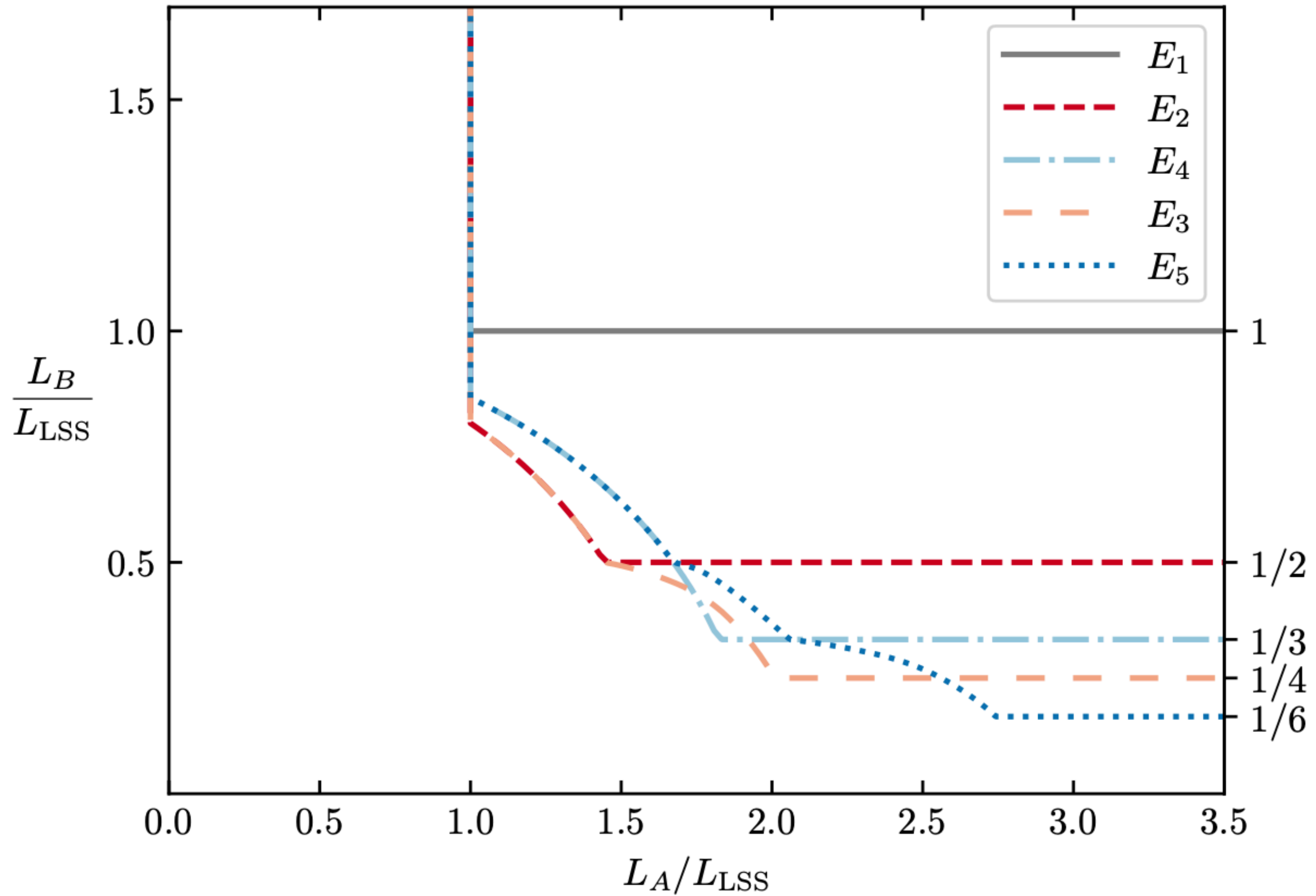


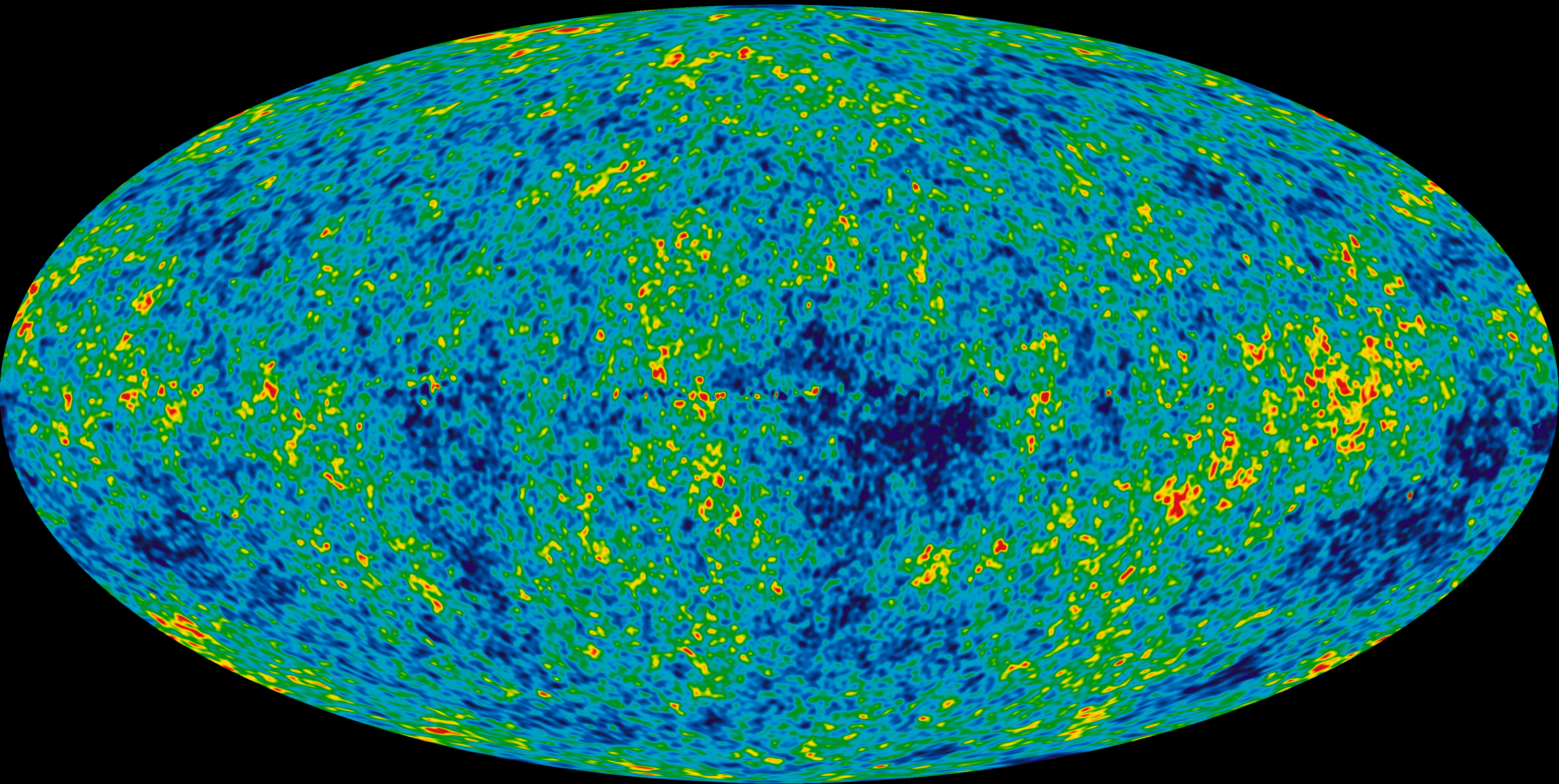


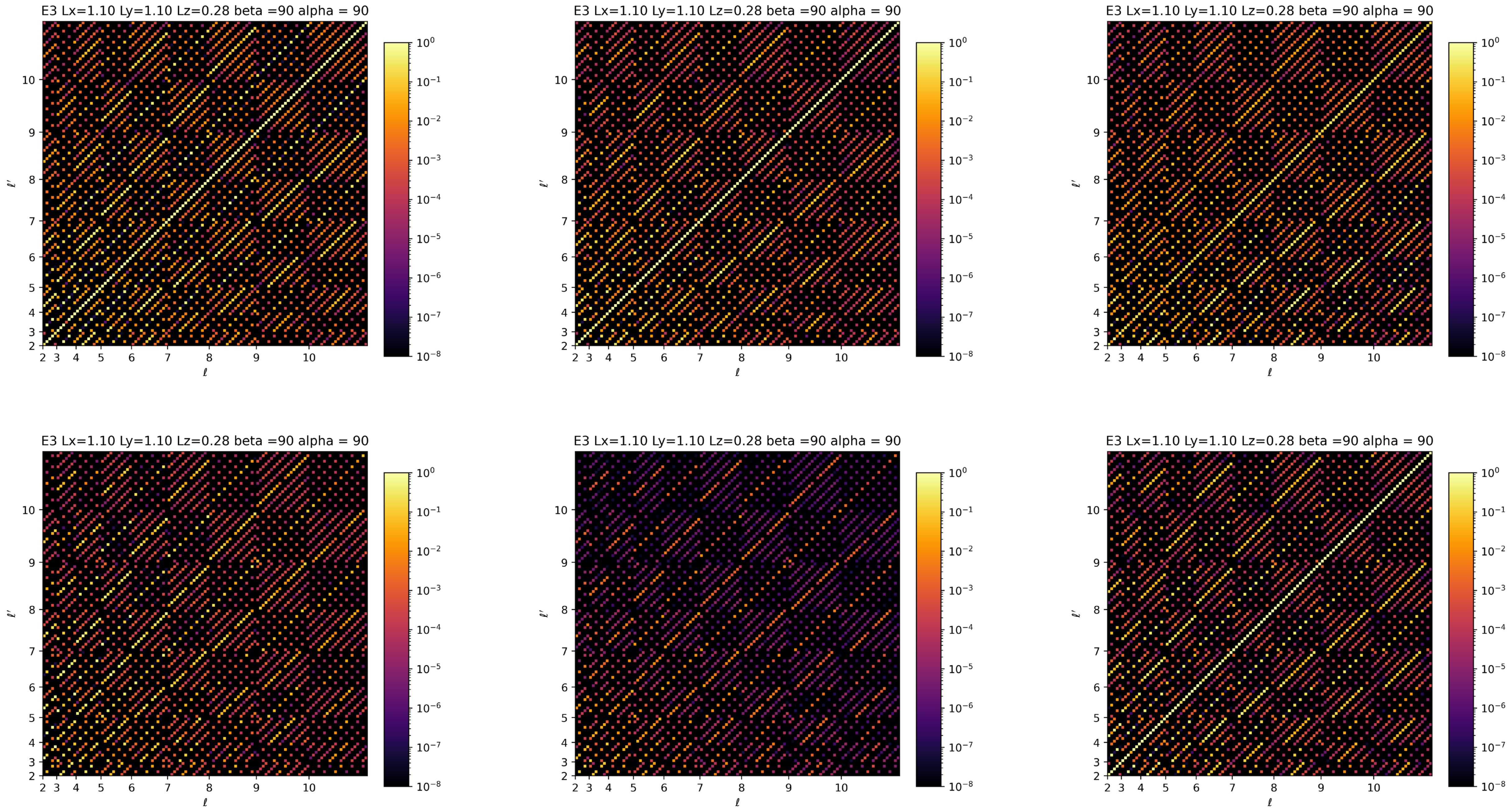


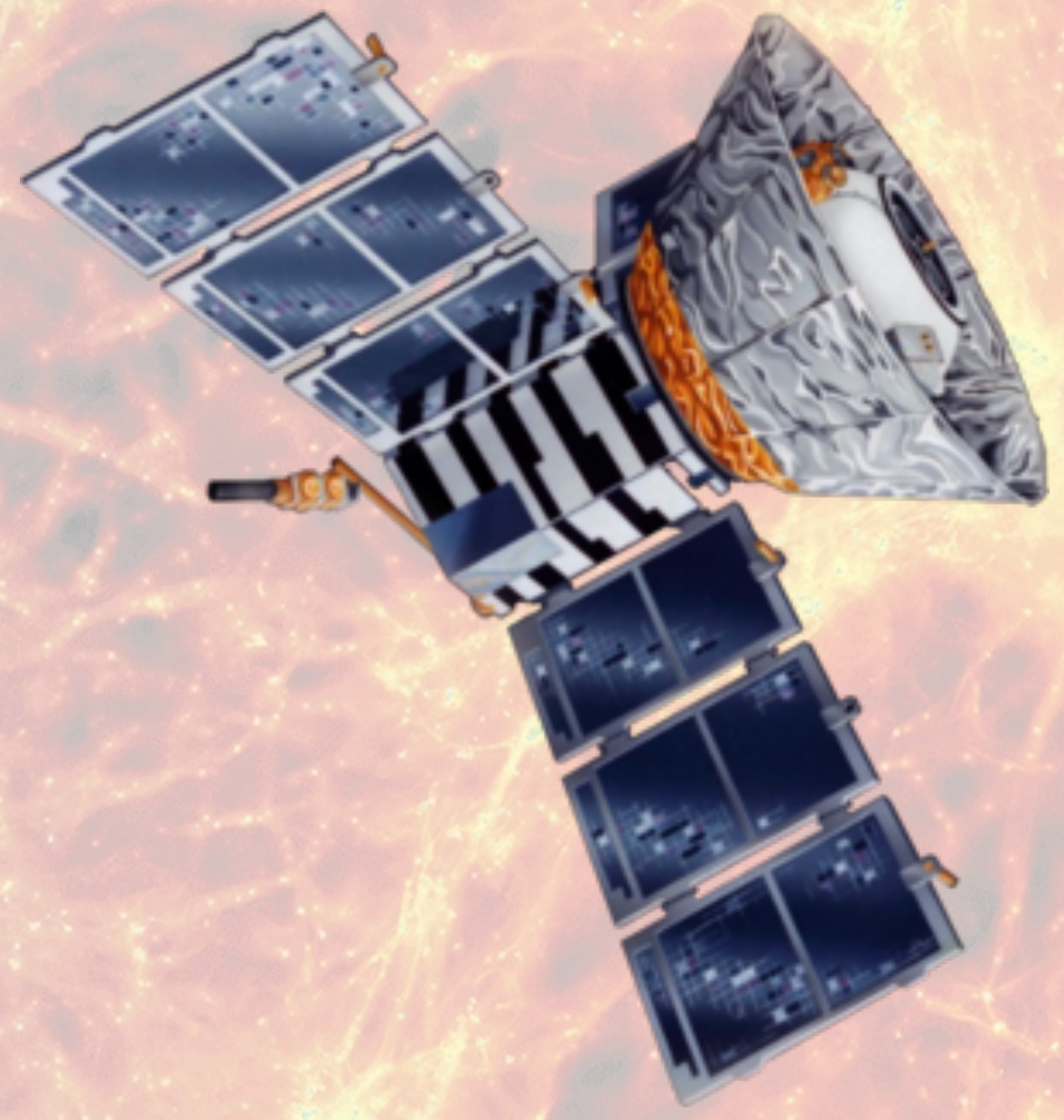
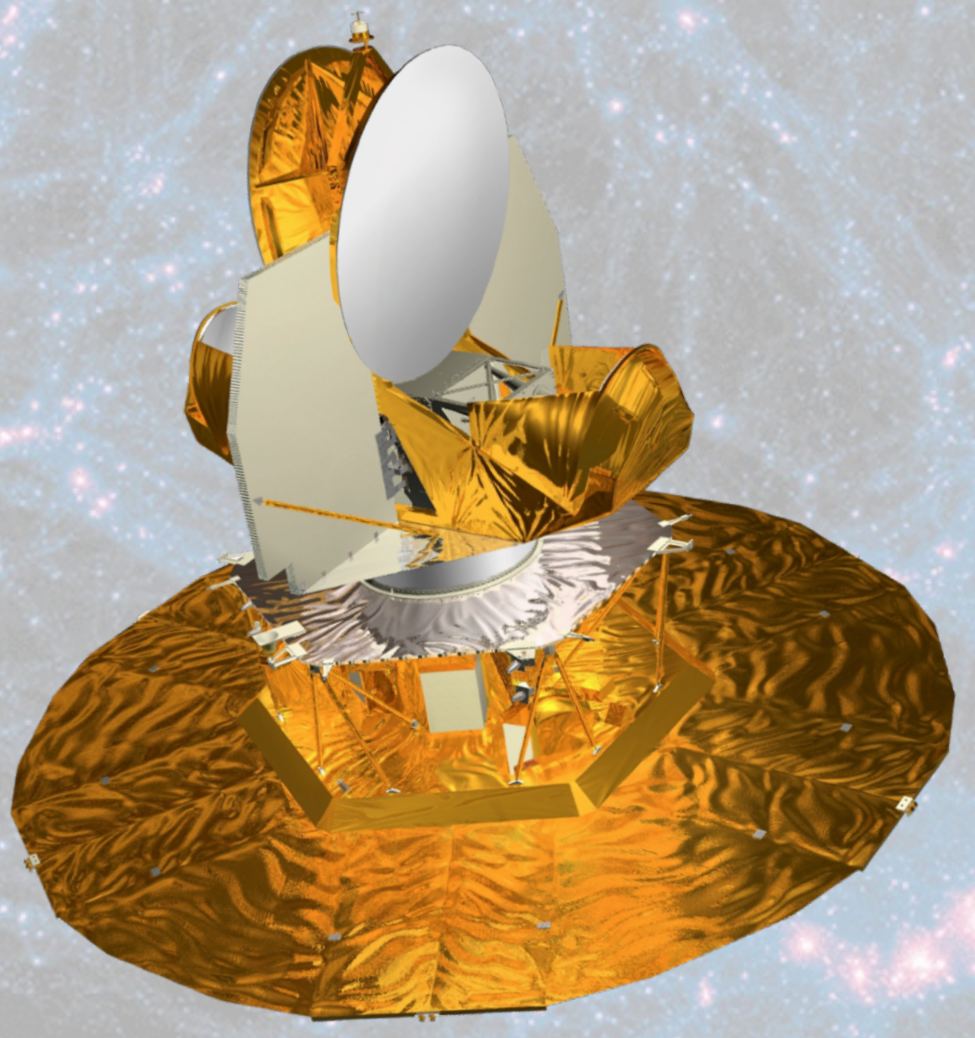




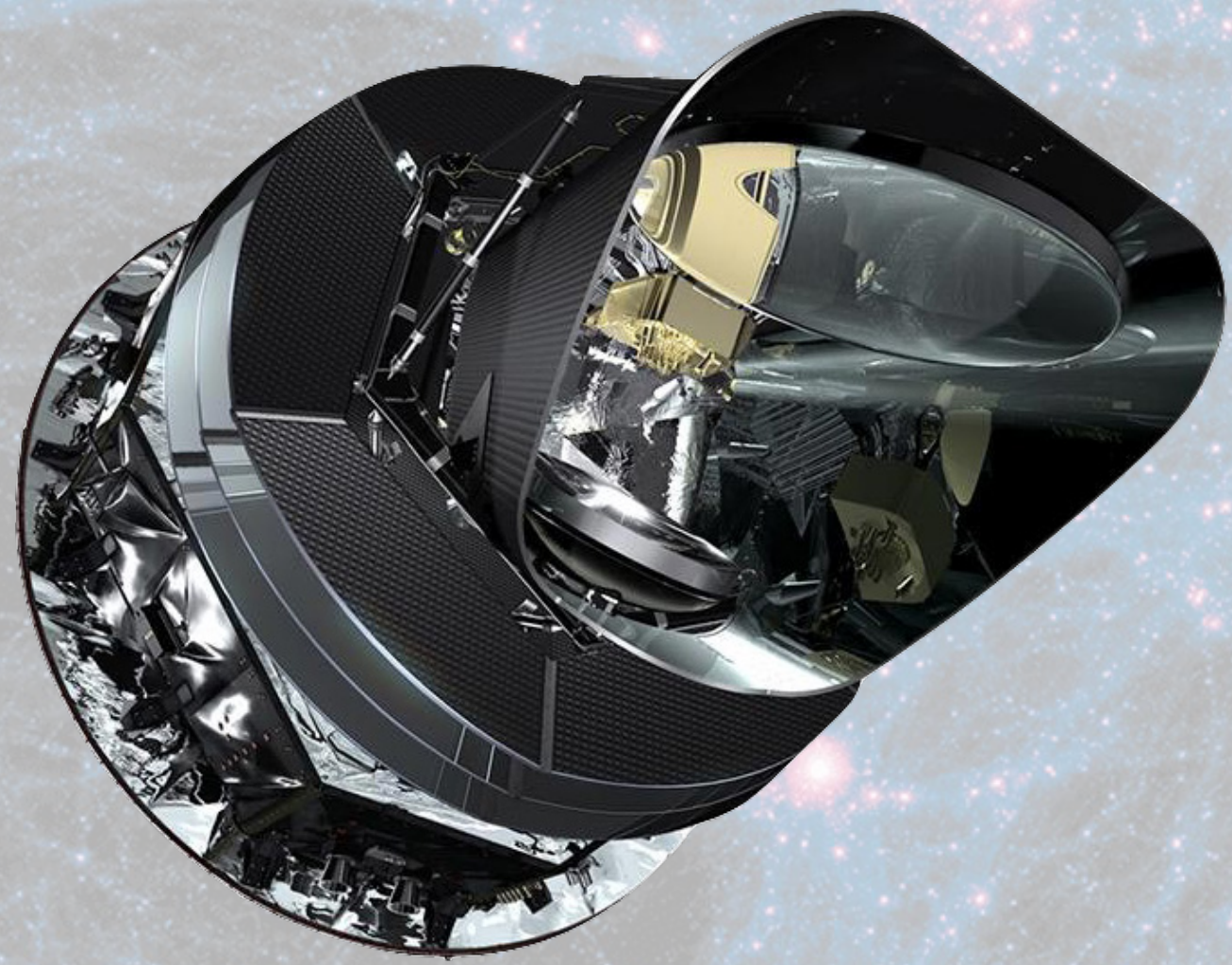




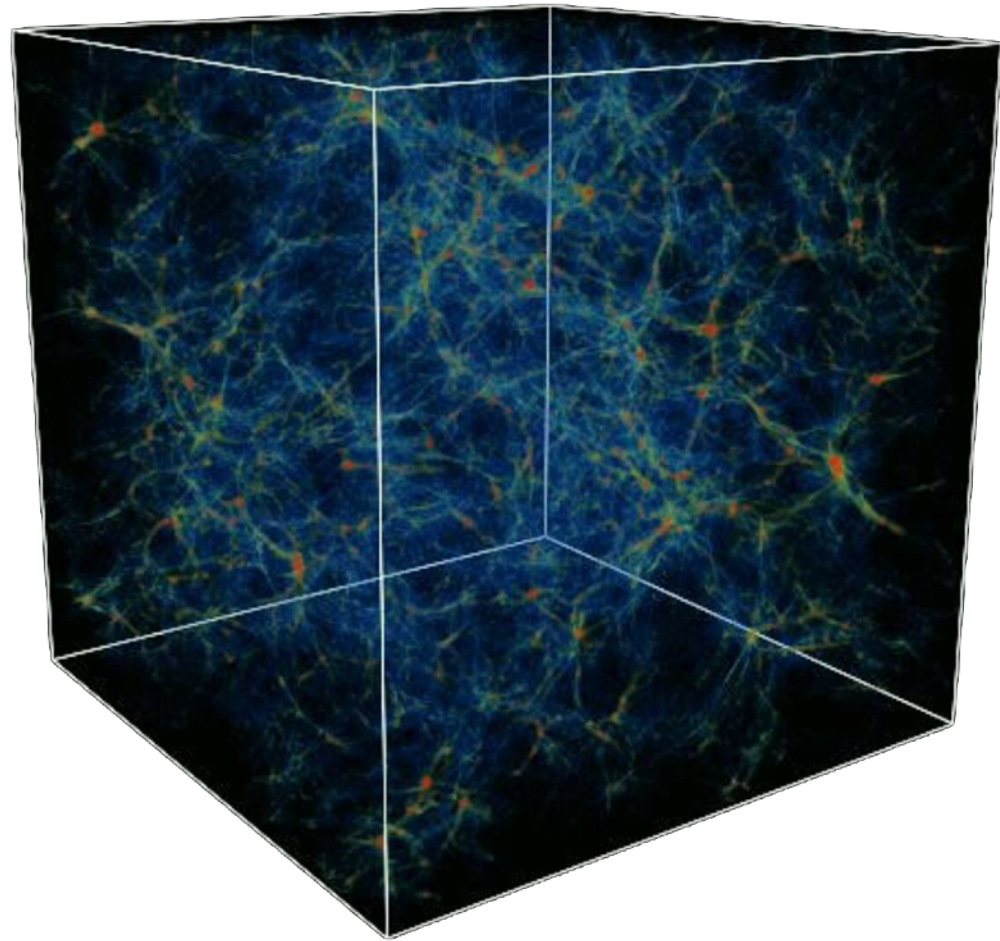




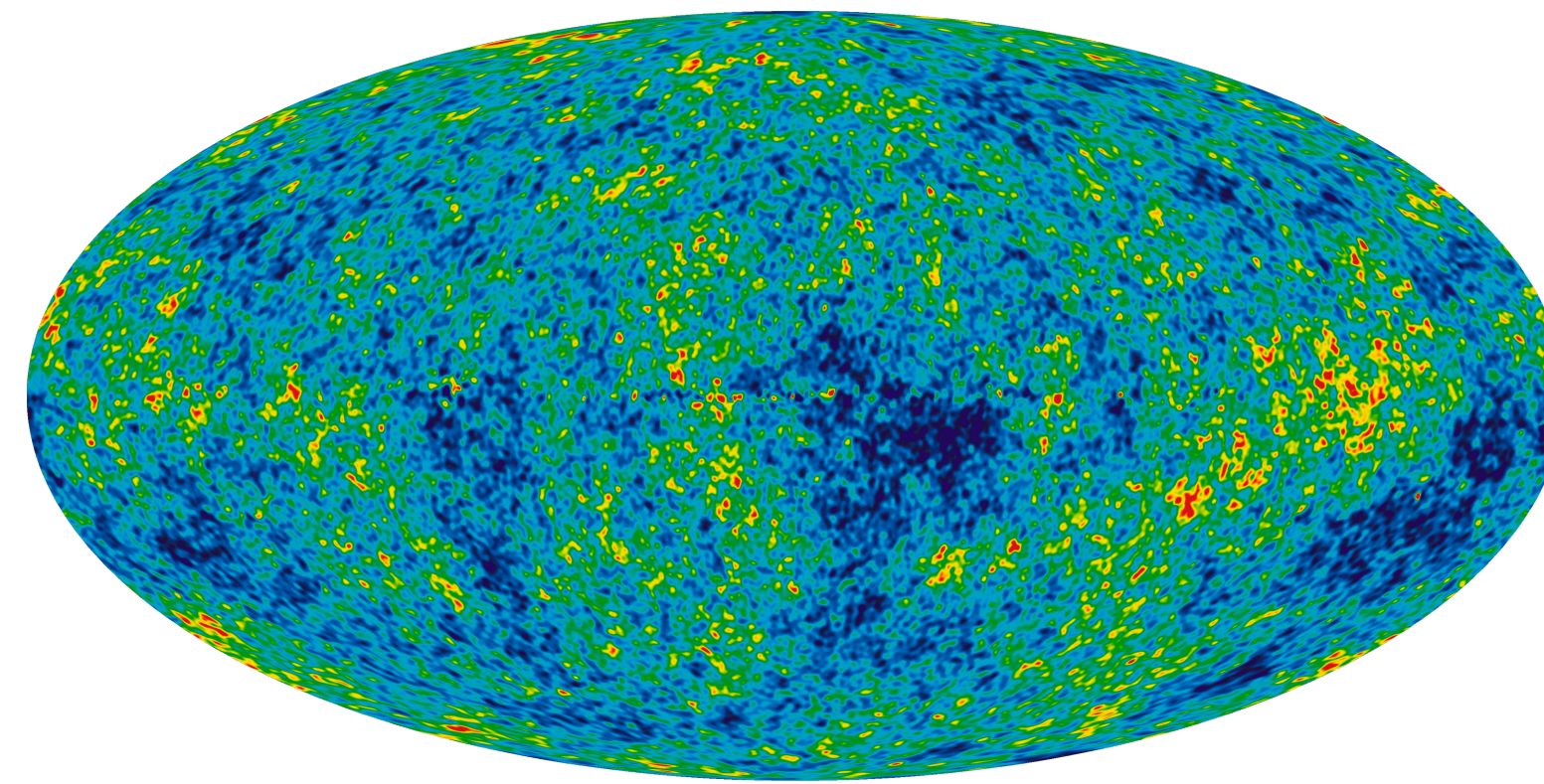
Summary



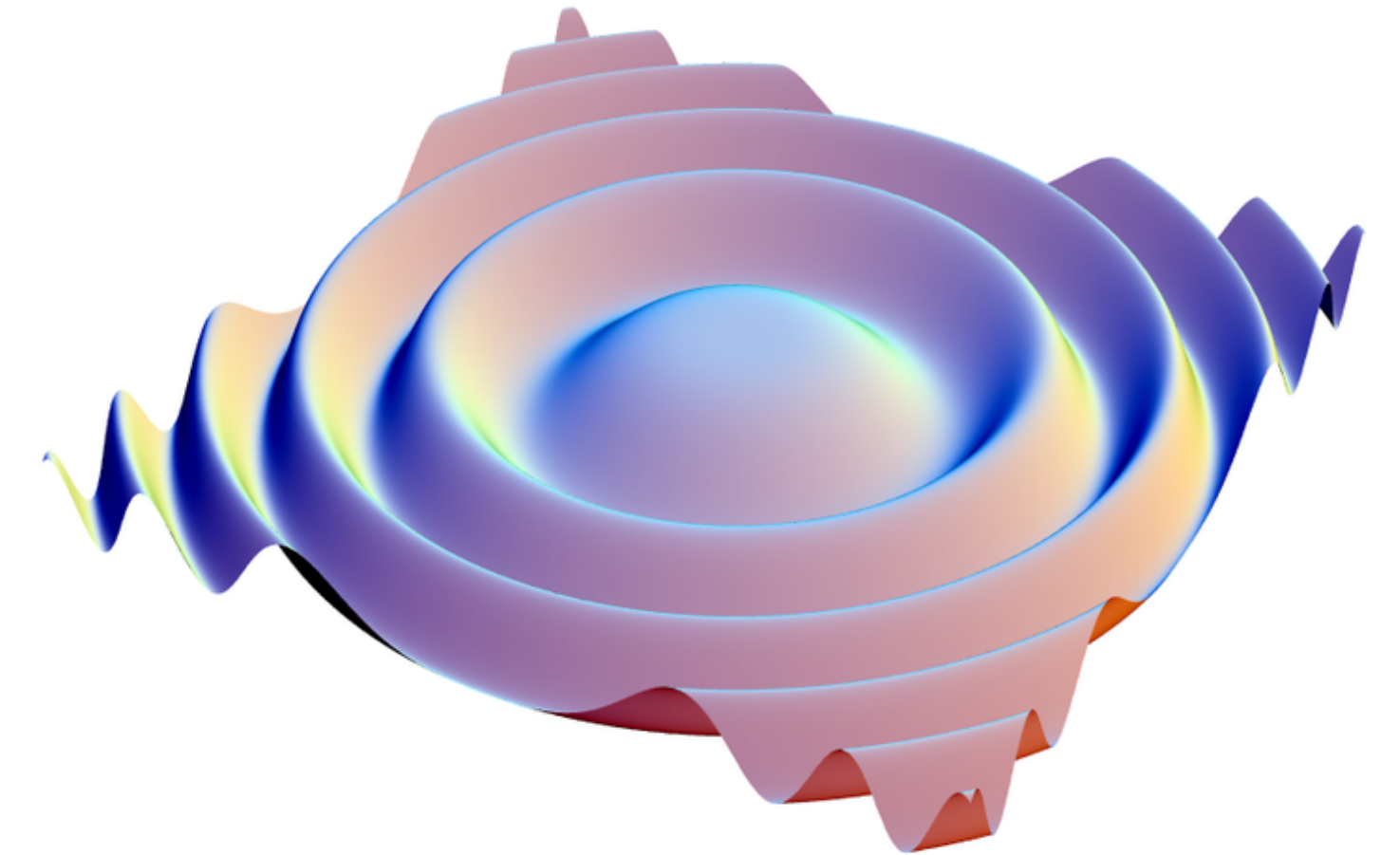
Ask me about



3D covariance
simulations

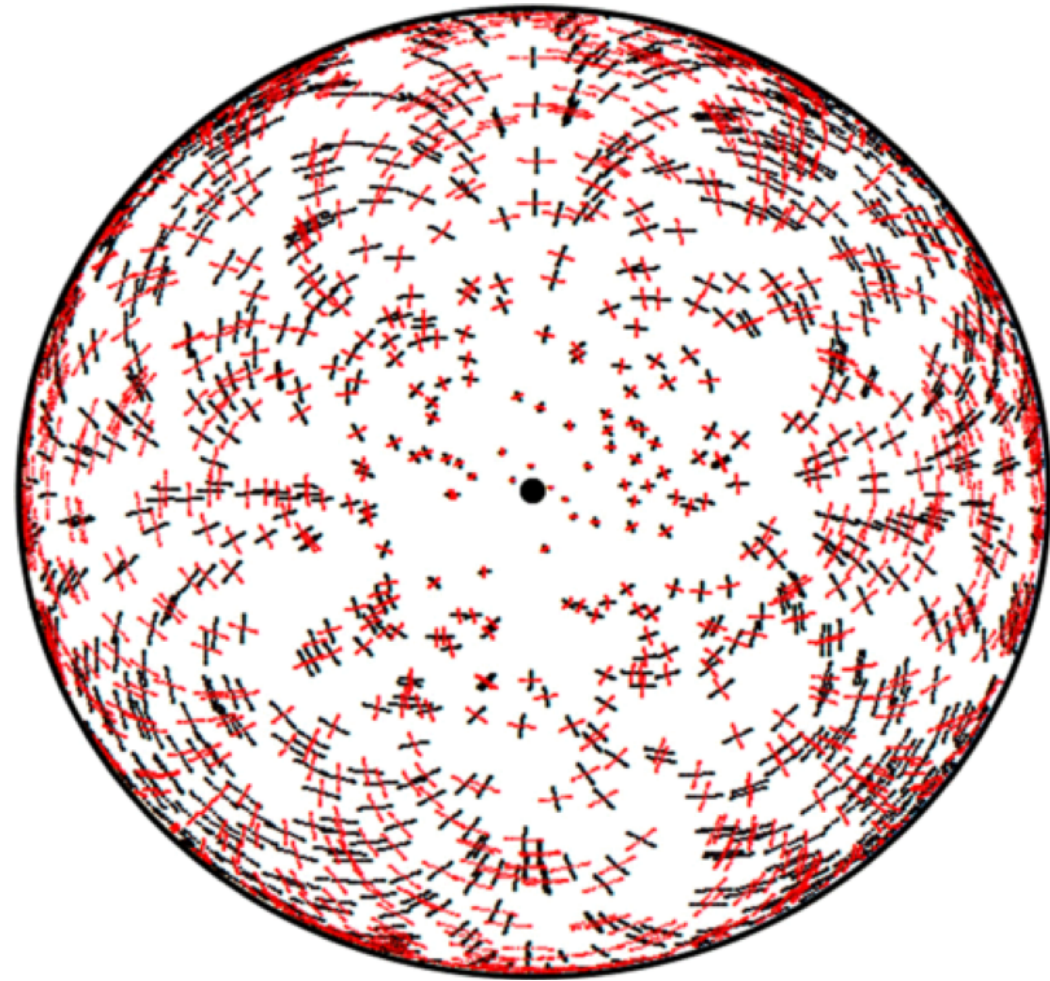


Circle searches in CMB surveys



GWs in Euclidean topologies

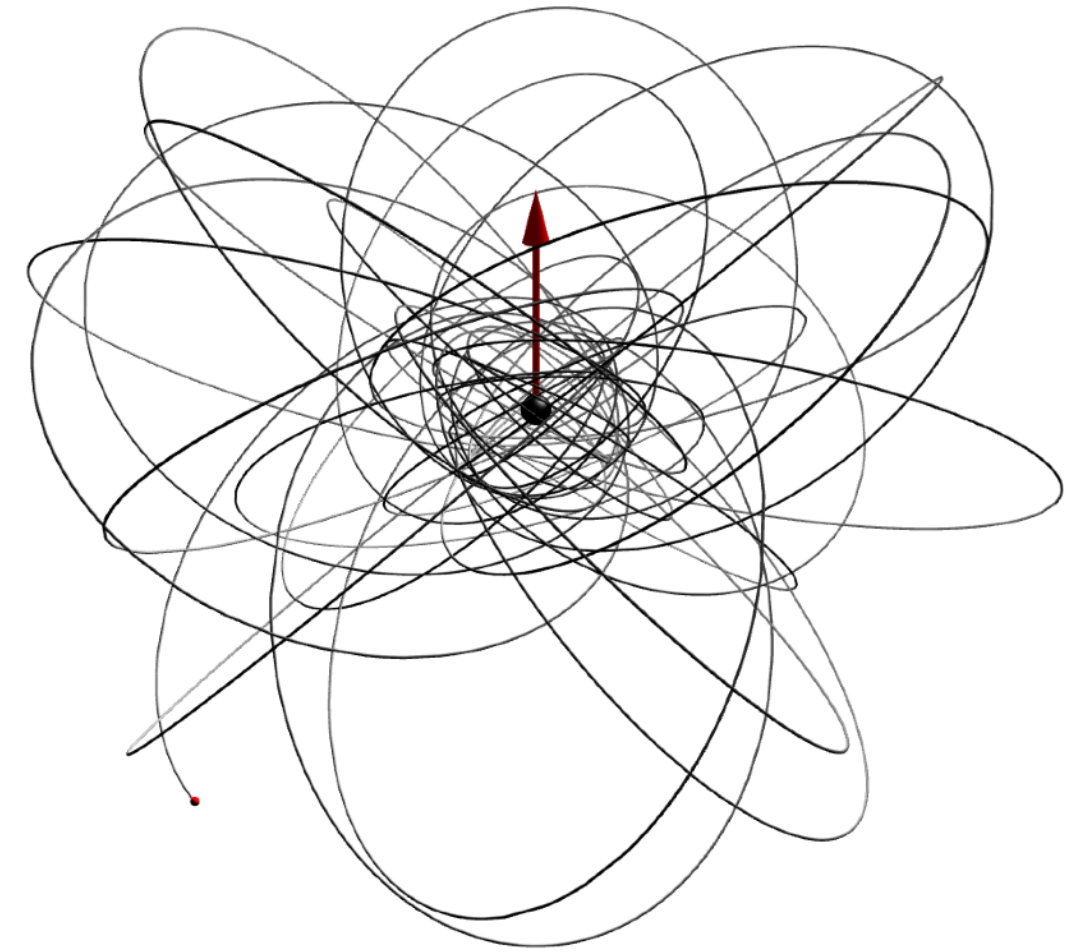
Ask me about



GWs and inflation
with Gaia data

$$H(p, q) \mapsto H(P, Q)$$

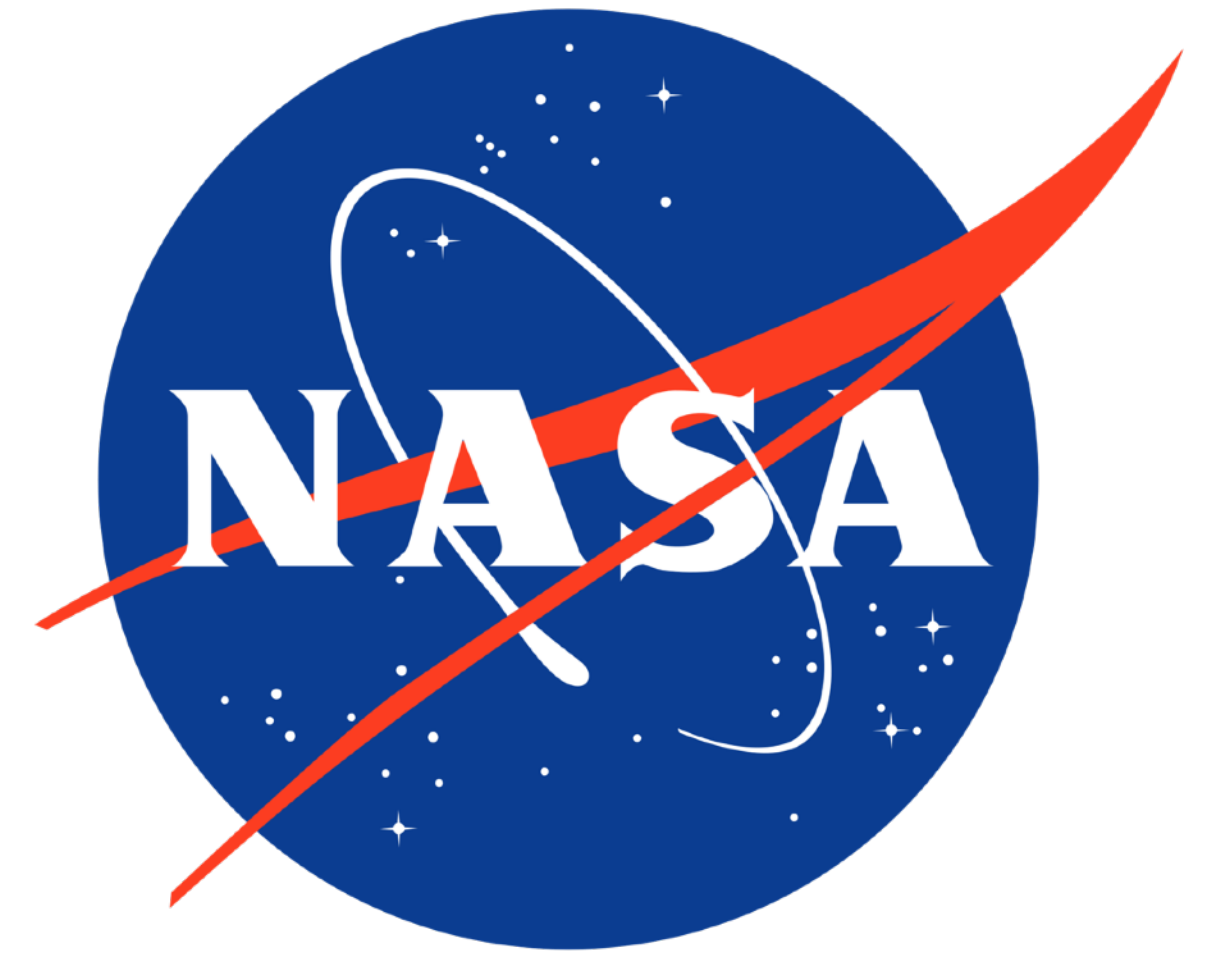
Canonical Perturbation
Theory for GR



Self force and resonances in EMRIs



**CASE
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UNIVERSITY**



Questions?



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CAMBRIDGE**